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THE
PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE SIXTH ANNUAL MEETING OF THE WESTERN PSYCHOLOGICAL ASSOCIATION AT MILLS COLLEGE, OAKLAND, CALIFORNIA, JUNE 18 AND 19, 1926.

WARNER BROWN, *Secretary, University of California*

The Sixth Annual Meeting of the Association was held in conjunction with the Tenth Annual Meeting of the Pacific Division of the American Association for the Advancement of Science. About sixty persons were in attendance at each of the four sessions. One session was devoted exclusively to Animal Psychology and one to Clinical Psychology and Tests.

On the evening of June 18 Dr. W. R. Miles, the retiring President, presented a series of highly interesting motion pictures entitled "Performance of Rats on an Elevated Narrow-Path Maze," demonstrating the advantages of motion photography in preserving records of actual behavior and at the same time showing a new and effective technique in maze work. He showed also pictures of monkeys being experimented upon by Mr. O. L. Tinklepaugh at the University of California.

Local arrangements, which were carried out with the utmost thoughtfulness for the convenience of the visitors, were in the hands of Dr. Kate Brousseau of Mills College.

Dr. H. A. Carr, as President of the American Psychological Association, was an honor guest.

Officers were elected for the year 1926–27 as follows:

President—Dr. Kate Gordon, University of California at Los Angeles.

Vice-President—Dr. Karl T. Waugh, University of Southern California.

Secretary-Treasurer—Dr. Warner Brown, University of California.

It was decided to accept the invitation of the University of California at Los Angeles to hold the next meeting there in June, 1927.

The program of papers was as follows:

JUNE 18, 9:00 O'CLOCK

1. A New Method of Studying Abstraction. R. C. Tryon, University of California. Introduced by E. C. Tolman.
2. Misuse of the Partial Correlation Coefficient. Barbara S. Burks, Stanford University. Introduced by L. M. Terman.
3. Reading Reactions for Mathematical Formulae. Miles A. Tinker, Stanford University. Introduced by W. R. Miles.
4. The Psycho-Galvanic Reflex. Lloyd A. Jeffress, University of California. Introduced by Warner Brown.
5. Introversion. Edmund S. Conklin, University of Oregon.
6. The Possibilities of Vocational Guidance through Analysis of Interests. Edward K. Strong, Jr., Stanford University.

Luncheon Meeting

Educational Psychology—What is it? Grace M. Fernald, University of California, Southern Branch.

JUNE 18, 1:30 O'CLOCK

1. The Physico-Mental Efficiency Rating of College Students. Albert Schneider, North Pacific College of Oregon.
2. Right and Left-Handedness and the Preferential Use of Either Eye or Leg. Stevenson Smith, University of Washington.
3. Originality of College Students. Kate Gordon, University of California at Los Angeles.
4. Effect of Time of Day on Learning. Warner Brown, University of California.
5. Ending Preferences as a Test for Music Ability. Paul R. Farnsworth, Stanford University.
6. Identifying the More Used Eye. W. R. Miles, Stanford University.

JUNE 19, 9:00 O'CLOCK

1. Kinesthesis and Transfer in the Water Maze. D. A. Macfarlane, University of California. Introduced by Warner Brown.

2. Recency, Frequency and Pattern Factors in Learning. Dorothy B. Nyswander, University of California. Introduced by E. C. Tolman.
3. Intelligence in Man and Ape. H. G. Wyatt, Stanford University. Introduced by L. M. Terman.
4. A New Method of Studying Ideation in Primates. O. L. Tinklepaugh, University of California. Introduced by E. C. Tolman.
5. Some New Forms of Platform Problem Boxes. Burton D. Thuma, Stanford University. Introduced by Calvin P. Stone.
6. Family Resemblance in Female Rats. Calvin P. Stone, Stanford University.
7. Animal Learning. H. A. Carr, University of Chicago.

JUNE 19, 1:30 O'CLOCK

1. The Organization of Pre-School Clinics in San Francisco. Jean Walker Macfarlane, University of California.
2. The Mills College Psychological Clinic. Kate Brousseau, Mills College.
3. Mental Differences Among Juvenile Delinquents. Maude A. Merrill, Stanford University.
4. Diagnostic Tests for Ability in Components of Typing. J. E. Coover, Stanford University.
5. Clinical Treatment of Some Unusual Borderland Cases. Ellen B. Sullivan, University of California, Southern Branch.
6. Study of Mechanical Abilities of Juvenile Delinquents. Frances Dougherty. Introduced by Ellen B. Sullivan.
7. Preliminary Study of Motor Abilities of Delinquents. Mildred Aden. Introduced by Ellen B. Sullivan.

VISUAL DISTURBANCES AFTER CEREBRAL LESIONS

BY HEINRICH KLÜVER

Columbia University *

Such an enormous number of observations on cerebral lesions were made during and after the war that it is not possible here to give even a condensed summary of the findings available for the student of vision. The following analysis is, as regards material, necessarily incomplete, but it tries to bring out some of the principal points bearing on the psychological study of visual sensation, perception and representation. The investigator who desires to make a first survey of the widely scattered literature may consult H. Wilbrand and A. Saenger (265), the *Ergebnisse* of Best (24), K. Goldstein and F. Reichmann (96), the summaries of G. Lenz and B. Pfeifer in the Ergänzungsband of Lewandowsky's "Handbuch" (166, 197) and the discussion of A. Wagenmann (259) in Graefe-Saemisch on the injuries of the eye by means of small and large projectiles (pp. 1897–2108). Anyone requiring information concerning the pre-war results on the pathology of vision is to be referred to v. Monakow (181) and vol. VII of Wilbrand-Saenger (264).

The number of cerebral lesions during the war made it in most countries necessary to found special hospitals in which the cases with injuries of this kind were treated. Centers of brain-pathological therapy and research developed—at least, so far as Germany is concerned—in Cöln, Frankfurt a.M., Berlin, Halle-Nietleben, Hamburg, München, and Tübingen whereas in Austria brain cases were sent to special stations at Vienna, Innsbruck and Graz. From the psychological standpoint the institutes for "research into the consequences of injuries of the brain" deserve special mention. Important contributions have been made by G. Holmes, P. Marie, C. Chatelin, F. Grignolo, K. Goldstein and W. Poppelreuter.

It is reported that visual disturbances appear in about 5–8 per cent of all war injuries. Uhthoff (250), for instance, concludes that visual disturbances are associated with 8 per cent of the total number of war lesions. Chatelin (46, 47) examined 300 wounds of the

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occipital region out of 1,200 wounds of the skull and found 85 cases in which there was alteration of the field of vision. He thinks that 7 per cent of the cranio-cerebral cases had visual defects. Such figures could not be expected on the basis of reports issued after the Franco-Prussian war and Tatsuji Inouye's analysis of injuries of the visual area in the Russo-Japanese war. In examining visual disturbances due to cranial traumata, it is necessary to consider the role of concussion injuries, posttraumatic apoplexia, injuries by means of instruments and gunshot—or shell-wounds. Obviously, the wounds caused by the modern military bullet and by shells are most important. Since the bird shot injuries which, as Wilbrand (**265**) has pointed out, may be justly compared with experimentally inflicted injuries have been rather infrequent, the study of visual defects has chiefly to rely on lesions caused by small-calibre projectiles. It may be of interest to mention here some of the calibres used: 6.5 mm. in the Japanese army, 7.6 mm. in the Russian, Belgian and Turkish armies, 7.9 mm. in the German army, and 8 mm. in the French and Austrian armies. The length of the missile amounted to 28 mm. in the German, 31.5 in the English and 39.2 mm. in the French army (**259**). An exhaustive classification of head-wounds caused by projectiles of this kind may be found in works on war surgery. Von Baracz, in his dissertation (**10**), insists that only 3 fundamental types of head injuries can be distinguished: (1) tangential wounds; (2) penetrating wounds, in which the missile has penetrated the skull and passed out again; (3) non-penetrating wounds (*Steckschüsse*). Surgeons—for instance on April 7, 1915, in Brussels (**246**)—have frequently emphasized the fatal effect especially of tangential wounds. In this connection, it is to be noted that the whole literature on cerebral lesions is exclusively concerned with cases which from the surgical point of view represent slight injuries or are successfully operated upon. Probably 90–96 per cent of the cases with penetrating head wounds died.

It has been pointed out again and again that it is impossible to conclude from the site of the external lesion that nothing but the underlying cerebral tissue is injured. The small pieces of fractured bone, hemorrhages and contusions have to be taken into account. Wounds caused by projectiles travelling at enormous speed can hardly lead to well circumscribed lesions but are, if not immediately fatal, accompanied by a widespread damage. A shot of 3 cm. length (Tilmann) will set 1,500 mm.^{3} of cerebral mass in motion, a transverse shot of 20 cm. length even 10,000 mm.^{3} In the case of

shells the tremendous pressure—according to Berger (17) up to 1,000 atmospheres—has to be considered since it is responsible for an enormous increase of pressure in the capillary system. Thus it is clear that even a detailed psychological analysis of a cranio-cerebral case cannot yield dependable results as regards the areal localization of functions unless a postmortem is made. Furthermore, in persons with brain injuries complications and infections may develop after several months and even years. "The possibility of a later development of epileptic or epileptoid states hovers like a dark cloud over the life of all persons with head injuries" (Aschaffenburg). As a point of medical interest, mention should be made of the fact that the recent war has placed at our disposal data concerning disturbances of vasomotility, of the blood picture, the blood pressure, and the genital functions of cerebral cases and has created a vast literature concerning the reëducation of brain-injured persons. (Cf. bibliography.)

In the work on visual disorders three chief lines of investigation may be distinguished: I. Examination of visual defects directed by an interest in the localization and function of a cortical "visual center"; II. Investigation of "higher" optical processes, *e.g.* depth- and form-perception, orientation, etc.; III. Consideration of the problem of localization in general in the light of the work on visual disturbances.

I

In most case histories it is reported that the first effect of the injury is total blindness. Whereas even slight injuries of the occipital lobe lead to total loss of vision at the beginning, even cases with very extensive lesions of the two hemispheres do not become permanently blind. In 1918, Wilbrand-Saenger (265) could not cite even one case of permanent cortical blindness. One year later, Saenger reported the first case (231). As a rule the initial blindness develops into a well circumscribed monocular or binocular visual defect. After lesions of one side we may have, *e.g.* relative or absolute homonymous hemianopsia with or without macular escape, upper or lower quadratic hemianopsia with or without macular escape, sector and irregular defects, paracentral scotomata, isolated central scotomata, an isolated defect or "sparing" of the so-called "temporal lune" (peripherer Halbmond, temporale Sichel, the temporal zone). Lesions of both sides may produce *e.g.* complete or incomplete double hemianopsia, double inferior or superior

hemianopsia or double central scotomata. It is necessary to recall that with regard to a cortical representation most work is directed towards localizing the following parts: (1) the position of the vertical line of separation; (2) the horizontal meridian; (3) the position of the macular area; (4) the area for the upper quadrant of the visual field; (5) the area for the lower quadrant of the visual field; (6) the area for the homonymous halves of the visual field which form corresponding parts in the binocular field; (7) the area for the "peripheral lunes." It has been emphasized rather often that the localizing value of many clinical observations is rather slight, but on the other hand, an extreme skepticism is not justified either since, as Goldstein (96) has pointed out, empirically certain definite relations between the direction of the shot and the defect in the field of vision are found. Although all attempts at a more exact craniometric determination of the injured occipital parts failed—Inouye's craniocoördinometer was not used in the last war—the result seems to be that clinicians in different countries fairly agree in their observations on the fact that given a direction of a shot a certain visual defect will arise. An enormous amount of clinical data* makes it possible to draw certain conclusions concerning the cortical representation of the retina. Before entering into the many controversial points as to this question, we shall state some of the "final results" or "working hypotheses" arrived at by some of the chief investigators on the basis of their war (and pre-war) observations. Pierre Marie and Chatelin (171, 172) concluded from their material that the cortical center of vision is localized in the calcarine fissure and in the lower part of the cuneus and the upper part of the lingual lobe; that the upper quadrant is projected on the upper edge of the calcarine area; that a limited lesion of the cortical visual area, on one side, produces scotomata of a hemianoptic type; that the macula is projected in the posterior part of the visual area near the occipital pole. Some of the findings reported by G. Holmes in 1918 were (127): "1. The upper half of each retina is represented in the dorsal, and the lower in the ventral, part of each visual area. 2. The center for macular or central vision lies in the most posterior part of the visual cortex, probably on the margins and on the lateral surfaces of the occipital poles. The macula has not a bilateral repre-

* Compare especially 1–3, 6–9, 12–15, 17, 30, 35, 36, 44–50, 52, 57, 60, 63, 64, 71, 72, 75, 89, 98, 99, 104, 105, 122, 125–132, 134, 139, 144, 145, 147, 156–158, 160, 168–172, 183–188, 192, 193, 210, 214–216, 218, 219, 222, 230, 231, 234, 237, 241, 242, 243–246, 248, 250–256, 265–267, 269–271.

sentation. 3. The center for vision subserved by the periphery of the retinae is situated in the anterior portions of the visual areas, and the serial concentric zones of the retinae from the macula to the periphery are probably represented in this order from behind forwards in the visual cortex. 4. Those portions of the retinae adjoining their vertical axes are probably represented in the dorsal and ventral margins of the visual areas, while the retina in the neighborhood of its horizontal axis is projected on to the walls and the floor of the calcarine fissures. 5. Severe lesions of the visual cortex produce complete blindness in the corresponding portions of the visual fields, or if incomplete an amblyopia, colour vision being generally lost and white objects appearing indistinct, or only more potent stimuli, as abruptly moving objects, may excite sensations. 6. The defects of vision in the fields of the two eyes are always congruous and superimposable, provided that no abnormality of the peripheral visual apparatus exists." In the same year, Wilbrand and Saenger reported as "new facts" from the war: 1, the existence of a complete inferior hemianopsia; 2, the existence of a complete superior hemianopsia; 3, the high frequency of central homonymous hemianoptic and double central scotomata in cases with an injury near the protuberantia occipitalis externa; 4, the existence of the so-called peripheral lune; 5, that permanent cortical blindness and permanent mind-blindness after gunshot wounds of the occipital lobe had not been observed; 6, the existence of an isolated color hemianopsia or amblyopia. The authors add a number of clinical facts meant to support the Wilbrand-Henschen theory of the "cortical retina" and to disprove von Monakow's view of "decentralization." On the basis of these facts, Goldstein (96) concludes that the close relation between site of the wound and visual defect justifies to a remarkable extent the assumption of a "projection of the retina." The symmetry of the visual defects in the case of straight penetrating shots implies a symmetrical arrangement of the cortical centers. Wilbrand-Saenger point out that in the case of incomplete double hemianoptic defects there is a continuous connection at the vertical line of separation in the visual field.

It will be necessary to discuss the above facts and related findings in their bearing on the various theories of cortical representation. With regard to the projection of the retina in general the possibilities of a circumscript (Henschen) and diffuse (von Monakow) representation of the different parts of the retina exist. Before the war, most neurologists and ophthalmologists were decidedly in favor of

Henschen's point of view. The experiences of the war seem to have substantiated this theory. In an English article, Henschen states: "The doctrine of projection has been victorious in all instances: there exists a 'cortical retina.' All these facts settle forever the doctrine of a complete projection, point by point, in all details . . . each retinal point has its cortical point, there exists a constant correspondence." (114) Thus Henschen could claim that Flechsig, Quensel, Pfeifer, C. and O. Vogt, Brodmann, Wilbrand, Kleist, Edinger, Uhthoff, Lenz, Best, Ramon y Cajal, Bianchi, Mingazzini, P. Marie, Chatelin, E. Smith, G. Holmes and Lister became adherents of his theory. It is, however, not quite correct that "nowadays" v. Monakow's "school is silent" as Henschen claims. In fact, it would not be difficult to compile a similarly imposing list *contra* Henschen. But it is true that in a certain sense Henschen's views have been confirmed. Poppelreuter writes: "The clinical facts concerning the coincidence between a certain psychic defect with a localizable cerebral injury cannot be denied," and he speaks of a "splendid confirmation of these clinical observations. Of course, "localization of symptoms" and the "localization of functions" are not the same (181), and the fact that there exists a "mathematical relation" (117) between points of the retina and the calcarine cortex does not necessarily imply the "dogma of a fixed localization" (Goldstein).

Here various facts related to the Henschen-v. Monakow controversy have to be mentioned. Henschen writes that the outcome of his researches "can be formulated as follows: the visual field coincides with the area striata" (114). According to Lenz (167) it was Vicq d'Azyr who in 1786, for the first time could show that a certain area of the occipital cortex is characterized by a macroscopically visible stripe which afterwards in most cases was named after Gennari or Baillarger. Later in connection with the development of perimetry quite a number of postmortem observations on the area striata of hemianoptic cases have been reported. Here the publication of Hun in 1887 should be mentioned. Henschen, in a series of very systematic clinico-pathological and anatomical investigations, tried to substantiate the "Faszikelfeldtheorie" formulated by Wilbrand in 1890 and thus placed himself in opposition to the theory of "decentralization" of v. Monakow who emphasized especially a diffuse distribution of macular fibers. In this controversy histological studies of the occipital cortex became of the greatest importance. On the basis of his cytoarchitectonic researches Brod-

mann, in his classification of cortical layers, distinguishes the "calcarine" and "occipital" type as being sharply separated. The fact that the area of the "calcarine" type, the area striata, is anatomically well-defined does not indicate anything as to its specific function. The above mentioned clinical investigations, Flechsig's studies of myelinization and especially the observations on "secondary degeneration" are more significant in this connection. As regards the relation between calcarina and peripheral visual apparatus, cases with long-standing peripheral blindness, cases with anophthalmia or microphthalmia are of special interest. Lenz who in his research on "the histological localization of the visual center" started from Brodmann's classification, examined cases of double peripheral blindness in man—duration of blindness from 8 to 39 years—and found that atrophy was strictly limited to the area of the "calcarine" type and that in the area of the "occipital" type no changes had taken place. The close agreement between the results of Lenz,* Minkowski's results on the cat and Henschen's findings is rather striking so that it seems hardly possible to object to the general result that the area striata and the visual center are identical. Before discussing this result, it should be recalled that the late Brodmann reported in 1918 at Würzburg on "individual variations of the visual area and their importance for the clinic of occipital shots" (37). Enormous variations between different individuals exist with respect to position, amount of area occupied, form, and the topical relations to the main fissures. Asymmetries of the area striata are very frequent. "Especially important is the larger frequency and stronger development of the lateralization of the visual cortex with or without operculum-formation in the left hemisphere." Brodmann himself believes that "the apparently incompatible antagonism" between Henschen and v. Monakow will, at least sometimes, disappear after demonstrating the individual variations. He believes, too, that now many of the striking discrepancies between surgical findings and perimetric determinations which latter again and again reveal the same visual defect will disappear. They will disappear, of course, for the adherents of the theory of the "cortical retina."

In criticizing this theory it has been pointed out that even the seemingly well established routine perimetric examination is far from giving us reliable information about the visual field. According to

* The discussion in this paper is confined to studies bearing on the cortical visual center. Lenz (166) believes that the war did not advance our knowledge concerning the primary optic centers and the optic paths.

Poppelreuter (212) the perimetric determination in general does not sufficiently take into account the difference between sensation of brightnss and form perception; the fact that the perimetric chart may show nothing but the field for the appreciation of movement; fatigue; the fact that both a hypofunction of perception and an "insufficient attention" may lead to charting the same defect. In case of "insufficient attention" it is generally not clear whether one has to deal with a hysterical "weakness of attention" or with a disturbance of "optical attention." Of course, such facts have not been overlooked by ophthalmologists and neurologists and the limited, and, as regards many functional problems, even questionable value of perimetric charting and "geometric" registration of residual visual defects has been frequently emphasized (54, 55, 119, 120, 212). The size of the visual field increases with size and intensity of the stimulus object. It is larger when the stimulus is moving or oscillating than when at rest. Poppelreuter (212) claims that he did not find even one totally blind scotoma after occipital lesions. The fact that gun shot injuries hardly lead to permanent blindness (Uhthoff and Axenfeld) has been explained by the large extension of the calcarine cortex (24, 37). If there is partial retention of vision, it never happens no matter what the direction of the shot may have been that "two isolated holes" in the visual field, appear, but a continuous defect will be charted. On the other hand, one should compare Poppelreuter's case, Walter Schulz.

Best believes that "the theory of vertical projection" according to which the upper retinal quadrant is projected on the upper lip of the calcarine fissure (24) is now well established. Lenz speaks of a confirmation in "innumerable cases" of war injuries (166). As cases of double inferior hemianopsia which are hardly found in civil practice, the cases of Uhthoff and Fleischer are to be cited. In fact the cases of double inferior hemianopsia are rather frequent in comparison with observations on double superior hemianopsia. Best (20) found 30.2 per cent of his cases represented double hemianopsia, 25.6 per cent right hemianopsia, and 44.2 per cent left hemianopsia. In initial stages of hemianopsia the chief defect was observed in 58.1 per cent in the lower visual field and in 5.8 per cent in the upper field by Best (20). Uhthoff found in 14 out of 16 cases of double hemianopsia a more pronounced visual defect in the lower quadrants. It is assumed that most wounded with double superior hemianopsia died on account of the neighborhood of the lower lip of the calcarina to vital centers (24, 166). Due to the fact that

hemianoptic studies have been regarded as the royal road to an explanation of visual defects, it is not surprising that a comparatively large number of cases of superior hemianopsia have been studied. Before the war there was only Inouye's case (135); now cases described by Axenfeld, Dimmer, Pincus, v. Szily, Uhthoff, and Wilbrand-Saenger are available. Poppelreuter observed one upper quadrantic hemianopsia and one upper quadrantic hemiachromatopsia in 64 cases.

The material on "vertical projection" is undoubtedly larger than that on the localization of the medial and lateral portions. The peripheral lateral zones of the binocular field are of special interest in connection with the cortical representation of the "peripheral lune." Cases representing isolated defects in this region are rather rare. Fleischer (63) and Borchardt and Löwenstein (33) describe such defects limited to the temporal zone as surrounded by amblyopic areas. Poppelreuter (212) cites 5 cases of hemianopsia with retention of the "peripheral lune," which was, however, more or less amblyopic. He believes in an isolated cortical representation of this lune. Best (20, 24) argues that the temporal zones of the retina are projected on the most posterior part of the visual cortex. It is assumed that this part of the cortex is most likely to be injured. This view sharply contrasts with the position of men like G. Holmes, Wilbrand, Saenger, and Lenz, and is chiefly based on Fleischer's observations (63, 64). Lenz being in favor of the projection on the anterior part of the visual area objects to Kleist's statement (143) that the lamina granularis interna profunda (Brodmann's layer IVc) of the left visual area corresponds to the nasal retina of the right eye and the lamina granularis interna superficialis (IVa) of the same area to the temporal retina of the left eye. Lenz argues: since the "peripheral lune" is localized anteriorly, the layer IVc should be longer towards the front. The fact that both layers cease simultaneously represents serious difficulties for Kleist's theory. (In this connection it is worth mentioning that there is a tendency in recent histological investigations to "localize" an "elementary optical function" in Brodmann's layers IV a, b, and c.)

In a certain way, defects of the "peripheral lune" are closely related to the frequently observed "concentric contraction" (96, 166). Entirely different psychopathological processes may be responsible for it. We may have to deal with (1) a destruction of the corresponding cortical area; (2) an amblyopia, a higher threshold for the peripheral zones; (3) a "weakness of attention" (212). The

discussion is especially concerned with the question whether a "functional" or "organic" interpretation is to be accepted. So far the question is not settled, but the majority of the investigators, especially Poppelreuter and Goldstein, do not favor the view that the phenomenon in question is a hysterical reaction. If in case of a homonymous hemianopsia the intact half of the visual field shows a contraction, it is reasonable to expect that this portion of the cortical area of the other hemisphere which corresponds to the peripheral parts is destroyed. It is of interest that in hemianoptic cases very narrow sector scotomata do not exist. Sector defects always involve adjacent parts which, according to Poppelreuter, probably means that a very slight injury of the cerebral visual area causes a peripherally appearing contraction. Poppelreuter thinks it possible that this contraction may appear without the accompanying sector scotoma. This would explain the contraction of the intact visual field. Keeping in mind that hemianoptic cases may show a slight or "diffuse injury" of the supposedly uninjured hemisphere the investigator of this phenomenon has to exclude the possibility of a "latent hemianopsia" or amblyopia (212). Goldstein (**83, 96**) distinguishes two types of concentric contraction: (1) a more or less circular field of vision; (2) a uniform contraction of the normal field with retention of the form of the normal boundary. He assumes that in most cases the first form is the expression of hysteria, while the second form may be accounted for by various physiological and psychological factors. Goldstein considers a "decrease of the excitability of the central apparatus" which manifests itself differently in different retinal parts and the factors involved in Aubert-Förster's phenomenon investigated by Jaensch (137). Goldstein-Gelb's analysis of the "tubular" visual field (**96**) led to the interesting result that the "organic" cases showed a more or less tubular field in campimetric, but not in perimetric examinations. Ring scotomata between 40° and 60° have been interpreted as the effect of an abnormal fatigability. The fact that fatigue may lead to concentric contraction and to spiral curves in charting has been pointed out by Holmes and Lister, P. Marie—Chatelin and Wilson.

Very often asymmetry of homonymous defects has been reported, for instance by Axenfeld, Best, Rönne, Goldstein, and Poppelreuter. Poppelreuter and Wilbrand conclude that the defects are more likely to be symmetrical if they are near the macula (**212, 265**). Since the adjacent areas of hemianoptic defects are amblyopic, an exact perimetric determination of peripheral defects is hard to achieve and

asymmetries result (212). Goldstein (96) considers an explanation on the basis of amblyopia and fatigue inadequate since it does not account for the fact that in most cases of right hemianopsia the visual defect of the right eye, in left hemianopsia the defect in the left eye is larger. Wilbrand-Saenger assume an "anatomical displacement" of fibers starting from two identical retinal points. Best could show that the restitution of light sensation may take place first in one, then in the other eye. In his case 5 (20) with right hemianopsia the right upper quadrant of the right eye was intact, the lower quadrant of the same eye defective. In the left eye there was complete blindness in the upper and lower quadrant. "To explain the asymmetry of the visual field by asymmetry of fibers . . . is partly impossible and partly a very arbitrary assumption for our cases." Best thinks that a congruence of hemianoptic defects is not even theoretically required. He recalls the well-known superiority of the nasal retina (visual acuity, color sense, etc.). In case of a functional explanation he is inclined to the view "that the eye with the intact temporal visual field functions better than the other one." Goldstein, too, emphasizes that there is not a mere quantitative correspondence between the nasal retina of one eye and the temporal retina of the other. In a study on micropsia Gelb and Goldstein (88) have recourse to Köllner's thesis that there is an inequality of "corresponding impressions" and a superiority of the nasal retina. In general, a variety of causes may contribute to an asymmetry of homonymous defects.

Most authors who had a large number of cases at their disposal noticed a more or less pronounced deviation of the "physiological vertical line of separation" of the visual field from the "geometric vertical." Leaving out of account the macular region and a possible "sparing" of the macula, such deviations are especially pronounced in tachistoscopic determinations of the "vertical." As a possible explanation various factors have been mentioned: slight movements during fixation, symmetry of the line of separation and double cortical representation. In this connection, Poppelreuter's statement (212) that, in his large material, he did not find even one case in which the isochromatic lines had a *concentric* position within the intact visual field is of special importance.

The problem of macular projection remains for consideration. Observations on cases with central and paracentral double scotomata have a bearing on this problem. War cases of this kind have been described for instance by Abelsdorff, Axenfeld, Bielschowsky, Best,

Brückner, Dimmer, Fleischer, Hegner, Gordon Holmes, Marie and Chatelin, Pascheff, Pötzl, Igersheimer, Poppelreuter, Uhthoff and Wilbrand-Saenger. Best found in a group of 86 cases 36 times disturbances of macular vision. There were 3 clear-cut homonymous central scotomata. Holmes-Lister found central scotomata in 10 out of 201 cases. Although scotomata of this kind are frequently accompanied by peripheral defects they may appear with a perfectly intact periphery. Such observations evidently show that the injury of a certain cortical area interferes with macular vision. But the localization of this area is still an unsettled question. There is undoubtedly a tendency to locate it in the posterior part of the visual cortex near the occipital poles. Some of the postmortem examinations confirm this view, others do not (24). Von Monakow speaks of a "diffuse distribution" of fibers, Henschen seems to accept the "pole hypothesis" of Lenz. In most war cases with small macular scotomata or complete macular hemianopsia "there was a lesion at the occipital tip, corresponding to the occipital pole" (114). In 1917, Edinger objected to the pole hypothesis (230). In 1918, Brodmann (37) pointed out that much might be said against it from certain "histotopographic points of view." Poppelreuter (212) claims that macular defects are associated with lesions near the median line.

The problem of the localization of the macula is, of course, extremely complicated by the frequently observed "macular escape." To explain this escape various theories have been advanced (20, 22, 24, 108, 108[a], 113-117, 127, 161-167, 225-227, 262-265). For Rönne the sparing of the macula is considered to be "a special case of hemiamblyopia." Taking into account the functional superiority of the macula, it becomes clear that the peripheral retina drops "below the threshold" while the macula is still functioning. Others (Förster, Igersheimer, also Henschen) have called attention to the fact that in case the pole hypothesis is accepted three arteries—arteria posteria, arteria media, and arteria temporalis—supply the macular region. Henschen says: "This theory is very probable in cases of vascular lesions, and is also accepted by Lister and Holmes" (114). Best (24) and others have emphasized the large extension of the cortical macula and the relatively protected location in the median plane. The most widely discussed theory, Wilbrand's theory of a bilateral representation of the macula, and its modifications by Heine and Lenz assumes that in the majority of men each half of the macula is represented in each hemisphere due to a division

of the macular fibers in the chiasma. Since the total macula is completely represented in the visual area of each hemisphere the macular escape of the hemianoptic side is made clear. In cases in which a sparing of the macula is not found and a central hemianoptic scotoma reaches the point of fixation the theory has to fall back on "individual variations" in assuming that in some men the bilateral representation is lacking. Recently, Wilbrand has modified his views along the lines of Rönne's theory (263). It has been pointed out that Wilbrand's "bifurcated division" of macular fibers in the chiasma has not been demonstrated anatomically. Heine and Lenz assume that these fibers leave the optic tract "about the middle of the parietal lobe" and run through the corpus callosum. According to Lenz, the existence of such a central commissure has been proven (1925) by Pfeifer (202) in his "fasciculus corporis callosi cruciatus." In general, the macular problem seems far from being settled. Goldstein-Reichmann (96) somewhat skeptically remark that it remains for consideration whether the difference in hemianoptic cases with respect to macular escape is to be explained by individual differences in the development of a special macular center or by an individually different double representation of the two maculae, or whether the assumption that "besides the chief region almost the whole carcarina" or even further parts of the occipital lobe are of importance for macular vision, suffices.

In spite of numerous war observations no definite results as to the cortical representation of the color sense have been obtained. Lenz (167) objects to a color center outside of the visual area, but considers it possible that the representation of this sense has a certain independence within the visual area. Here "the upper layers (II and especially III) stand in an especially intimate relation to the color sense." These findings of Lenz are related to the hypothesis stated by Wilbrand in 1887 that in a superficial layer of the cortex the sense of color is represented, in the next layer the sense of form and further below the sense of light. Henschen thinks that we are dealing here with an "open question." Best (24) does not share the skepticism of Hess who considers all color perimetry as useless. His opinion is that a charting of color defects is not sufficient but has to be supplemented by threshold investigations. Uni- or bilateral complete hemiachromatopsia are very frequently associated with a high degree of amblyopia (250). Lenz considers that Wilbrand's case Kostew with a small paracentral hemianoptic scotoma for colors represents the slightest hemianoptic disturbance ever observed (166).

Pötzl assumes that the "conscious perception of color" does not take place in the calcarina, but in occipital regions outside of the calcarina. P. Marie and Chatelin state that there is no reason for accepting a special cortical center for the sense of color. Without entering here into the question of amnesic-aphasic color disturbances, it may be mentioned that Best assumes a "*Farbfeld*" in the left hemisphere. Pathological conditions affecting optic fibers, tract and corp. gen. ext. most frequently lead to a disturbance of red-green vision (24).

As regards the sensation of brightness frequent mention is made of the fact that it actually persists in scotomatous regions (Poppelreuter, Pötzl, Rönne, Bard), but Goldstein and Best are inclined to the view that there are "absolutely blind" scotomata. Whereas Igersheimer reports that there is an impairment of dark adaptation in cases with cerebral hemianopsia, Behr says that this mechanism suffers after pathological conditions of the optic tract. Brückner starting from Tschermak contributes to the problem of "the localization of contrast and similar phenomena" (40). He could induce the phenomena of simultaneous and successive brightness- and color-contrast in the blind regions of cases with a hemianopsia caused by a lesion of Gratiolet's optic radiation. This led him to the conclusion that a localization in the corp. gen. ext. is impossible. He thinks of a representation in the visual cortex. Poppelreuter (213) remarks that Brückner's two cases were probably amblyopic. Von Economo, Fuchs and Pötzl have also reported on the behavior of contrast phenomena after gunshot lesions of the visual area. The importance of retinal factors in contrast phenomena has been pointed out by Best.

In this connection the appearance of subjective visual phenomena in cases of occipital lesions observed *e.g.* by Poppelreuter, Axenfeld, Uhthoff, Pincus, Krause, Holmes and Lister deserves special mention. Pfeifer (197) found that such phenomena were described in 6 of his 34 occipital cases. In general, we are dealing here with photopsiae, visual hallucinations, scintillating scotomata, scintillation followed by amaurosis fugax, apparent movements of different objects, and extreme blinding sensation. The hallucinations which in most cases were projected into the hemianoptic or amblyopic area represent frequently depressing war pictures. In some instances, only the one-half of the hallucinatory forms appeared. Most authors assume that in such cases the cortical center was not completely destroyed. The very important study of Borchardt and Löwenstein demonstrated that electrical stimulation produced the same disturbances in the

patient as those which took place spontaneousy: turning of the patient's eyes to the right; scintillation; flames; visual hallucinations. Krause in a similar study ascertained the interesting fact that the experimentally produced subjective visual phenomena did not leave any after-images (148).

Very often hemianoptic persons show certain disturbances of the movements of the eye. The ability to follow an object with the eye or to fixate it may be lost. Judging from war cases, Best and Holmes (20, 22, 127) believe that in certain regions of the calcarina and the gyrus angularis eye-movements can be released. Pötzl thinks of the median parts of the convexity of the occipital lobe as centers for convergence and fusion and of the gyrus angularis as a center for lateral eye movements. It is not possible here to discuss the large number of observations on pupillary reactions and on the fundus and muscles of the eye. There is some agreement that the winking reflex is released cortically (127, 212). It does not seem possible to elicit eye movements by a stimulation of hemianoptic areas, but Pötzl discovered that frequently repeated stimulation caused a delayed movement of the eyes towards the light.

II

Obviously, many of the foregoing studies in which the chief interest was centered around the form of visual defects and the conclusions as to the "localization" of these defects show, as Piéron (207) puts it "how fully the idea of a point by point representation of the peripheral sensory surface on the cerebral cortex has been verified" in consequence of the great number of occipital war lesions. It is the psychological analysis of the "higher" visual functions of the occipital cases to which we have to turn in order to recognize the strictly limited importance—or impossibility—of a "point by point representation." Quite a number of neurologists pointed out that there was a striking contrast between the slight increase of knowledge in question of cortical activity and the overwhelming number of carefully studied pathological cases furnished by the war. Edinger, commenting on a report of Saenger (230), made the statement: "At any rate, these studies have brought us to a point where the question arises whether we have to continue in the same way as in the past or whether we have come to definite conclusions." He thinks that the barrenness in questions of cerebral topography will be overcome by employing the methods of psy-

chology. Goldstein claims that psychology has to take the leadership when it comes to formulating physiological theories (81, 82). It is unnecessary to add that a behavioristic psychology cannot meet such demands. In fact, what is needed is apparently just the opposite of what a behaviorist would do. An objective registration of defects of various sorts is exactly the thing that has been done and has led to the above-mentioned barrenness. What has been neglected is the analysis of the pathologically modified actual experiences of the patient (82). What has been done is to state that the patient cannot distinguish a circle and a square of the same visual angle, but what has been neglected is the analysis of what in this case the optical experiences of "square" and "circle," etc., actually are (213). Such considerations have led to Goldstein's demand for "*phänomenale Analyse*" and Poppelreuter's emphasis on the concept of "*Funktionsverminderung*" as contrasted with the "*Ausfall*" of the classical theory of localization. Thus Poppelreuter finds that his investigation which aims at the exact analysis of "the whole wealth of variations of pathological phenomena" confirms this theory in general, but that it is entirely unsatisfactory from the psychological point of view. We think one cannot blame neurologists and ophthalmologists for charting, registering and describing defects "objectively"; but one can blame the psychologist for neglecting the demand for an exact analysis of the subjective psychic experiences voiced by the very same neurologists and ophthalmologists.

The various aspects of this very interesting methodological situation will become more apparent in reporting some facts made available through studies on higher visual functions. Here Gelb-Goldstein's analyses of brain-pathological cases and Poppelreuter's and Holmes' work are of special importance. In most cases, the theory of the "cortical retina" stressing geometric schematization does not take into account (1) that even the perception of color is not to be traced back to the excitation of "perceptive points"; (2) the perception of movement; (3) the perception of form; (4) the "compensatory mechanism" which overcomes the discrepancy between constantly changing retinal images and the stationary field of vision (212). It is not possible here to discuss the different processes that supervene upon sensation and contribute to our optical *Gesamterfahrung* as it actually is. It seems to be settled, however, that an additive, sensationalistic account is unsatisfactory.

Poppelreuter, W. Fuchs, Best, Gelb, Goldstein, Holmes, Hine, Riddoch and others have investigated "the affection of the power of

localizing the position in space" or, more shortly, disturbances of visual localization. Characteristic disturbances of "absolute" (egocentric) as well as of "relative" localization may occur. Poppelreuter in examining disturbances of absolute localization used a pointing-perimeter (Greifperimeter). The patient had to point at a white disc of 10 cm. diameter. The conclusion is drawn that an erroneous "localization of direction" or pointing-past constitutes a relatively independent symptom and that it has no definite relation to the form of the visual defect of the patient. The patients localized incorrectly not only within the blind area, but also outside of it. Even patients without visual defects made "erroneous localizations." Best's studies on absolute localization led to the result that the hemianoptic patients displaced the median plane either towards the defective or towards the intact field. In cases of complete hemianopsia a displacement towards the blind side seemed to be the rule. Given an incomplete hemianopsia the median plane was frequently displaced in the opposite direction. Best considered that in such a case the injured calcarina determines the localization of direction. W. Fuchs (76-77), who carefully studied various "phenomena of displacement," emphasizes the rôle of psychological factors. Under the artificial conditions of perimetry one may find that exactly "half of the visual field is blind, but on the other hand, the fact exists that many hemianoptic persons do not even notice such a defect. Their visual field is organized in the same way as the field of normal individuals; it has "right" and "left," "above" and "below," and a special center which is "straight-forward" or "just before me." This center determines the *subjective* median plane whereas the objective median lies in the blind field. This reorganization of the visual field takes place spontaneously. The patient is unaware of the change. It does not take place, however, in cases of hemiamblyopia where the calcarina is not entirely destroyed and still assumes to a certain extent the functions of a receptive station. But if in complete hemianopsia the reorganization of the visual field has to produce conditions similar to normal ones—to do so is a "biological necessity," as Fuchs and Goldstein point out— it can be done only if the function of the anatomical fovea is taken over by a more eccentric part of the retina situated in the intact area by a "pseudofovea," a fovea in the functional sense. Such a patient intending to look straight at an object, will displace the median plane in such a way that the retinal image of this object will develop not on the fovea, but on the pseudofovea. The position of this pseudo-

fovea is not fixed, but it varies with the apparent size of the object. The larger the object, the more peripheral is this functional fovea situated. In spite of this peripheral position, the visual acuity of the new "center of distinctness" is higher than that of the still intact foveal area. The distance between anatomical and functional fovea is chiefly determined by the *Gestalt* (in Fuchs' sense) of the object. "Active" or "passive" attention can do little in influencing the distinctness of the object. Fuchs assumes that a "*strukturgemässe Reaktion*" (in W. Köhler's sense) to the *form* of the visual field in complete hemianopsia is responsible for the entire reorganization as brought out in the experiments. He dwells on the important rôle of central factors in normal vision and states that, in view of the vicarious macula in strabismus anatomico-histological conditions do not account for the superiority of the macula, but central factors (Bielschowsky's case of monocular diplopia). In general, it is not clear why not all patients with complete hemianopsia displace the median plane. It is known that a hemianoptic defect may manifest itself as "*vision noire*" and "*vision nulle*." In the first case we have a large positive scotoma filling half of the visual field. A reorganization of the field of vision is not likely to take place under such conditions (93) since the injured calcarina still influences the localization. But finally, the rôle of the blackness sensation in determining localization in space may become negligible and the same reorganization observed in patients who from the very beginning saw "nothing" takes place (**80, 92, 93**). Goldstein (92) points out the impossibility of assigning a certain "visual acuity" or a certain "local sign" to different retinal areas or points. According to him, the "functional value" of a retinal point is relatively independent of the anatomical structure. As regards the organization of the field of vision it does not matter whether the excitation involves the two halves of the retina, but what actually matters is that this process of excitation is similar to that which determines the organization of the total field of vision in normal people. Such considerations make it clear, too, why a pseudofovea is not found in hemiamblyopia, but only in complete hemianopsia. Since the "anatomical substratum" in hemiamblyopia is still sufficient to warrant a more or less satisfactory normal functioning, the biological necessity for a pseudofovea cannot arise. Goldstein indicates that the facts recorded in the studies of hemianoptic cases point at a general law which holds for all processes of restitution in cerebral lesions; here, as we see, a position is maintained which theoretically is closely related to that

of von Monakow. If in complete hemianopsia some measure of vision is regained in the blind area the attention of the patient is directed towards the new vague and indefinite impressions. This may finally lead to a superiority of the impressions of the amblyopic area and may, as W. Fuchs thinks, explain the displacement of the subjective median towards this area.

The fact that a hemianoptic person looking at an object uses the pseudofovea instead of the anatomical fovea shows that the pseudofovea is also the center for the motor apparatus of the eye (80). But the above-mentioned errors in pointing show that with regard to certain motor performances there exists a lack of adjustment to the new optical conditions, a discrepancy between *Sehraum* and *Tastraum*. The patient points at the place where he localizes the object optically. The question whether the pointing mechanism finally adjusts itself to the changed optical conditions or not has been made the subject of special investigations (Gelb, Goldstein, Igersheimer). Here Igersheimer's data on the use of specially constructed spectacles for hemianoptic persons are to be considered.

The above discussed errors in absolute localization are closely related to the frequently described errors in visual space—discrimination, to the *Augenmassfehler* of hemianoptic persons. This disturbance originally discovered by Liepmann and Kalmus manifests itself in the bisecting of a horizontal line in such a way that the part corresponding to the defect is smaller than the other. Best and Poppelreuter find that the "typical" error is not always constant; sometimes no error is made or the part in question is too large. Poppelreuter claims that there is no definite relation between kind of error made and kind of visual defect. Best and Goldstein do not agree with him. To exclude the possibility of "optical apraxia" Poppelreuter used the tachistoscope. Whereas Fuchs' explanation of the phenomenon emphasizes psychological factors, Pötzl (217) tries to trace it back to eye movements.

Here other disturbances of relative localization as reported by Fuchs in his observations on "phenomena of displacement" are relevant. In a very general way one may speak of a "centric shrinking of hemiamblyopic areas of the visual field." The objects are not localized on the basis of the indistinct impressions in a normal way, but they are displaced towards the center. Fuchs could show that the amount of displacement is determined by factors like the "degree of clearness," the position of the object and the time of exposure; no displacement may take place, however, if the parts seen in the

amblyopic area are parts of a characteristic *Gestalt*. Under the influence of such total *Gestalt*, the localization of which is determined by the parts of the intact field of vision, frequently no displacement in the amblyopic area takes place. Additional information concerning the functional connection between the injured and intact visual area is furnished by a case of Gelb-Goldstein (**88**). Whereas tachistoscopic experiments revealed a micropsia in the affected field, all objects in the intact field had normal size. But if an object was exposed in such a way that the intact as well as the affected field were involved to the same extent, the whole object seemed to be smaller. This indicates that the perception of figures may be determined by the processes of the injured visual area. It was found, then, that in cases of asymmetrical exposure the size of the object was determined by that area which was stimulated by the larger part of the figure.

In this connection Poppelreuter's "*totalisierende Gestaltauffassung*" has to be mentioned. When in cases of complete hemianopsia a circle was exposed tachistoscopically in such a way that exactly half of the circle was in the blind and the other half in the intact field, most patients claimed that they had seen a total circle and not a semi-circle. Fuchs was able to confirm Poppelreuter's results (**77**). A completion took place in the case of certain "simple" figures as circles, squares, ellipses and symmetrical stars. Even if parts of such a figure were lacking in the blind field, a completion was observed. In the extreme case a semi-circle was seen as a total circle; it was exposed in such a way that the straight line of demarcation was situated ***within*** the intact field. In most instances the completed parts of the figure had the same appearance, the same color and form properties as the actually perceived parts. The completion did not take place in well-known figures (dog, etc.) nor in straight lines. "Simplicity," therefore, does not necessarily mean geometric simplicity. In no case was it possible to complete letters. Fuchs rejects Poppelreuter's explanation of a "*vorstellungsmässige Ergänzung*" and tries to show experimentally that neither visual representations nor residua, neither "passive" nor "active" attention could bring about a completion. This phenomenon as well as the above mentioned phenomena of displacement point, according to Fuchs, to a "simultaneous ϕ process" in Wertheimer's sense, to a specific total process. It is of interest that Gelb-Goldstein's case with micropsia saw a semi-circle of 10 cm. diameter as a total circle of 8 cm. which shows that even in spite of the central completion the

size of objects may be determined by processes in the injured visual area. Gelb has described cases with "*dysmorphopsia*" who saw near objects in the normal way, but upon increasing the distance reported a very characteristic change of the form of these objects. They became "thin" and "narrow," a circle *e.g.* turned into an oval. In monocular vision the dysmorphopsia existed only for the temporal field of vision (79). Gelb also reports a case with pathological changes concerning the main directions in space (80). For this person an apparent vertical line showed 8–12° inclination towards the left. An objective vertical as well as the after-image of a luminous vertical line was inclined towards the right; the left end of an objective horizontal appeared too high at the left end and too low at the right end. Extreme difficulties arose in judging oblique directions. The surroundings with houses, chimneys, men and walls seemed also to be inclined towards the right.

As regards disturbances of absolute depth perception only a few observations are available. One of the patients of Gelb-Goldstein (80) saw all objects in smaller size and localized them in the far distance. But the same patient overestimated also time intervals considerably. Poppelreuter (212) investigated disturbances of relative binocular depth perception. In tachistoscopic experiments he found disturbances of this kind in about 50 per cent of his cases with visual defects. He was unable to establish any definite relation to the kind of visual defect, to mind blindness, and to disturbances in localizing directions. Gelb (80) does not agree with Poppelreuter's assumption that we are dealing here with a relatively independent disturbance. Poppelreuter also assumes that disturbances of *Ueberschauen* represent something specific. Optically, a relatively small picture is more easily taken in than a large one. If the visual angle of a face exposed tachistoscopically is about 50°, the normal person is agnostic for a certain while since such a figure is not visible at a glance (212). Poppelreuter found that many of his patients had great trouble in recognizing forms under experimental conditions of such a kind when the size of the visual angle did not involve any difficulties for normal persons. Cases of mind blindness did not always manifest this disturbance.

Another function which can be specifically disturbed is what Poppelreuter calls "the searching for something in the field of vision." The patient was placed half a meter before a chart with 57 different objects (colors, figures, numbers). Upon the experimenter's naming one of these objects the subject had to open his

eyes and to show it with a stick as quickly as possible. The average time for this process was considerably increased in cerebral and especially in occipital cases. Poppelreuter found that the visual defect as such did not necessarily cause a disturbance of the searching ability nor was it always associated with mind blindness. Here mention should be made of Pfeifer's investigations (198) and the attempt of Busch (42) to get at the "optical component" in searching by using the maze.

Closely related to this phenomenon is the disturbance in "visual counting" (*optische Zählstörung*) investigated by Best. The disturbance manifests itself in the incapacity optically to count objects like coins, matches, and lines beyond a certain number. Since many hemianoptic persons as well as cases without visual defects counted correctly, Best concludes that this counting disturbance is a specific disturbance and cannot be traced back to the presence of a visual defect. The symptom was present in 18.2 per cent of right homonymous hemianopsia, 28.9 per cent of left hemianopsia and 46.9 per cent of double hemianopsia. In homonymous hemianopsia counting was possible at least up to 4–5. No difficulties were encountered when the patients were allowed to use their fingers. The optical counting ability was lacking entirely in 3.5 per cent of the cases.

Severe disturbances in the recognition of forms have not been observed very often. Most patients were able to recognize circles, triangles and squares, etc., if placed before them. Poppelreuter thinks it is not the absolute impossibility but the slowing down of the process of recognition that is most frequently found. In tachistoscopic projection simple figures had to be exposed for 2–3 seconds, while for normal persons .1 second was sufficient. Using more complicated figures, the drawings of the patients showed that with a few exceptions the total form was correctly reproduced, but minor details had been neglected and errors had been made in reproducing the symmetrical relations. In comparing figures the forms of which had a certain similarity it resulted that even patients with severe visual defects made correct comparisons.

An extremely careful psychological analysis of various disturbances in the perception of optical *Gestalten* has been furnished by the work done on the patient Schn. . . . in Frankfurt who over a period of several years was made the subject of different investigations (81). Schn. had an injury of the occiput: visual accuity and depth perception sufficient; no disturbances of the light- and color-sense; a bitemporal contraction of the field of vision; no disturbances

of language. He could read with the assistance of head and finger movements, but was otherwise totally word-blind. Optically, he could not recognize "the most elementary *Gestalten*" like triangles, straight and curved lines. Gelb-Goldstein believe that the loss of such *Gestalt* impressions was the cause of the alexia and the "apperceptive mind blindness" (Lissauer) of the patient. Schn. seemed to see nothing but colored and colorless spots in a certain distribution. Theoretically, it is assumed that the physiological processes which must be postulated as the material correlate of *Gestalt* impressions are disturbed. Benary thinks that the optical *Gestalt* blindness and the tactile *Gestalt* blindness which could be demonstrated in a special study and the intelligence defects point at a general disturbance which manifests itself in the same characteristic way in different fields. Recently the sexual functions of this patient have been analyzed by Steinfeld (**238**). Poppelreuter (**213**) has criticized the interpretation of Gelb-Goldstein. He assumes that Schn. is not a case of "pure apperceptive mind blindness," but that it is chiefly a perceptive disturbance, a perimacular amblyopia, which is responsible for the symptom picture. Gelb (**80**) in his reply has pointed out on the basis of further observations that a decrease in perimacular visual acuity does not account for the symptoms.

Under the term "hemianoptic weakness of attention" Poppelreuter has described a certain pathological hypofunction of attention. Goldstein, Pötzl, and Fuchs have also been interested in the rôle of attention in visual disturbances. The disturbance analyzed by Poppelreuter can be best illustrated by quoting Head's description of his case No. 8 with right hemianopsia: "The loss of vision over the defective half of the field was not absolute and he could appreciate moving objects. Moreover, if with both eyes open two similar objects were exposed at exactly the same distanee from the fixation point, that to the right was frequently not appreciated, although it might be recognized if shown alone" (**103**). Poppelreuter found 7 cases in which only one of two figures or points which were simultaneously exposed in the above mentioned way could be seen. If, however, only one point was exposed in the affected field, this point was perceived. It is of considerable interest that two points could be seen simultaneously when before the exposure the "active attention" of the patient was directed towards the affected field. But since the activation of attention itself may be pathologically disturbed or even lost, it seems possible that hemianopsia is not a destruction of "recipient" cerebral areas, but a

"total blocking of attention." This would be of far reaching importance for the theory of localization since it would imply that a diagnosis of pure sensory disturbances in cerebral lesions is not possible at all. The immediate practical consequence, then, would be that the perimetric determination may show the perceptive integrity of areas which are totally defective as soon as the "apperceptive function" is examined (212).

Here Poppelreuter's "psychic color weakness" which manifests itself in confusing certain shades and colors is to be mentioned. Although there was no colorblindness, especially blue and green shades were confused in occipital cases. Poppelreuter thinks that the symptom is indicative of a weakness of the "absolute color sense" which, in contrast to the "absolute pitch," most people possess. Goldstein-Reichmann think it highly probable that Poppelreuter had to deal with cases of acquired red-green blindness. Gelb and Goldstein observed a case with acquired total colorblindness without central scotomata and without hemianopsia. After one year a restitution of the color-sense began and could be studied carefully (96). Gelb's two patients had lost the ability to see "surface colors" (Katz). The objects assumed "film colors" of different "thickness" in such a way that the darker shades were the thickest ones. This led to an interesting discrepancy between tactile and optical impressions. The surface colors returned first in foveal vision for the lighter shades. Results as regards the problem of "constancy of colors" and other perceptual problems could be obtained (85). In general, the author assumes that we are dealing here with a more primitive and less structurated form of perception. In this connection, Gelb-Goldstein's study of various aspects of amnesia for color names is relevant. The different disturbances found in studying this symptom seemed to indicate the presence of a "more concrete and less rational attitude" and a very general disturbance of a "categorical attitude" (87). This could be shown in the reactions towards colors, as well as to other objects. The problem of the influence of language on the chromatic threshold is touched upon. It is assumed that "categorical attitude" and "possession of language in its significative aspect" are an expression of the same basic attitude.

Patients unable to perceive movement have been observed by Pötzl, Gelb-Goldstein, Best and others. The case of Gelb and Goldstein (82) saw the handle of a stopwatch or a moving light suc-

cessively at different places. He could not see stroboscopic movement or the movement of a rod passing over the skin although the tactual impression was identified.

It is not possible here to report on the rôle of the optical factor in apraxia, aphasia, agnosia, alexia, agraphia, amusia and on the frequently investigated disturbances in arithmetical operations. The literature on these problems is, of course, of great importance for the psychology of perception as well as of thought and for many problems of localization. The bibliography contains a sufficiently large number of references to orientate the reader about the results gained through the war (16, 28, 39, 53, 58, 66, 68, 73, 90, 110, 136, 141, 150, 153, 173, 189, 194, 195, 196, 197, 206, 223, 240). We may call attention to Poppelreuter's concept of "optical apraxia," to his claim that he did not find even one occipital case with a "textbook-mind-blindness," and to his various methods for detecting disturbances of higher "optical thought processes." Other workers on the last problem have analyzed the methods of compensating for destroyed optical functions by means of other functions in the same and in different sense fields. The independence of relational thinking from sensory material has been considered. For the study of thinking as it has been carried on by Bühler, Lindworsky, Jaensch, Selz and others pathological material as it was available during the war has been utilized. The superiority of the left hemisphere which became manifest, *e.g.*, in aphasia, alexia and in disturbances of the color and form sense has been considered by various investigators.

III

It remains to examine some of the more general aspects of the problem of localization as brought out especially in connection with the study of visual disturbances (5, 18, 19, 25, 27, 29, 32, 34, 51, 59, 69, 70, 92, 93, 95, 97, 100–103, 106, 109, 118, 138, 140, 142, 146, 149, 151, 154, 159, 174–176, 180–182, 189, 200, 201, 203, 205, 206, 207, 209, 211–213, 215, 224, 229, 233, 236, 268). Mollweide (180) states that there can be no doubt that the adherents of a strict localization are losing ground. Association psychology, so he thinks, is practically dead and functional points of view are being emphasized everywhere. Krisch (151) asks us to be extremely cautious in localizing psychic functions. Jaspers (138) summarizes his views in the following way: (1) the results obtained in the field of anatomical projection do not amount to anything and are of no

consequence for psychopathology; (2) mental elementary functions which are localizable have not been found; (3) the facts of a localization of complex clinical symptoms are incoherent and only of diagnostic significance. He adds that the statement that differences in mental disturbances must be traced back to disturbances in localization is mere theory. One might just as well assume that cerebral changes are caused by mental phenomena. Both statements are equally metaphysical. Jaspers and von Monakow agree that it is necessary to distinguish: (1) anatomical localization; (2) localization of nervous functions; (3) localization of clinical symptoms. As a matter of fact we get anatomical findings which cannot be related to neurological or psychological functions and even "the most elementary phenomena" the psychologist is dealing with are from the neurological standpoint so complex that they cannot come into existence without the activity of the whole cortex. One may speak of a well established localization of residual clinical symptoms when it comes to "destructions of primitive neurological functions." But in general the results seem to be very disconcerting: one may combine all modern methods of examining an anatomical lesion; one may, on the other hand, undertake the most elaborate analysis of the corresponding psychological disturbances; but so far the result is that there is "no relation whatsoever between the two aspects of the analysis." Head (103) wants to employ the term "cerebral localization" in a strictly limited sense. "Firstly, it signifies determination of the site of the lesion associated with disturbance of some function, such as the use of language; secondly, it implies discovery of the exact nature of the functional disorders which follow injuries to different parts of the brain." Head concludes: "No function is 'localized' strictly in any part of the cortex . . ." Those who think they have grasped the exact nature of scientific "analysis" will be interested to learn: ". . . the abnormal manifestations can be described only in terms of the act which has been disturbed, and do not reveal the supposed elements out of which it has been synthesized." In 1922, Henschen pointed out that Head should present "anatomico-clinical reasons" for his views; otherwise no "vernünftige Kritik" could deal with his system. A large number of authors dwell on the fact that the negative results as regards the localization of mental functions are not surprising since a consideration of the preliminary problem as to what is localizable at all has been neglected. Küppers (154) considers it nonsensical even to

attempt a localization of phenomena like "sensations," "perceptions," "representations" and "feeling-tones." Only an "empirical" and "practical" localization is possible, and a definite advancement can be attained due to certain discoveries concerning the structure and function of the autonomic nervous system and due to the development of Hussert's phenomenology (compare here especially 26, 138, 152, 205, 233). Küppers claims all facts are in favor of the view that the cortex is not the "highest cerebrospinal reflex center," but the thalamus. The cortex is "subthalamic" in the sense of functional subordination. He cites certain observations of Head and Holmes as supporting his theory. Bleuler (27) hoping that we are approaching "a biological interpretation of mind" is favorably impressed by theories like Küppers'. He himself makes use of Stransky's distinction between a "*Noopsyche*" (intellectual functions) and "*Thymopsyche*" (drives, instincts, affects) for questions of localization. In 1914, v. Monakow stated—so far as we can see, without the help of "phenomenology"—that the expression "seeing" used in everyday life implies a number of heterogeneous activities of the optical apparatus which, subjectively, impress us as uniform. He points out that there are forms and degrees of seeing or, expressed differently, reactions to light stimuli in which a conscious light sensation is not elicited. All these reactions are of the same class *physiologically*, but not psychologically. Thus there is a "tremendous gap" between precise anatomical data and ill-defined optical factors. In 1924, von Monakow tried to define ten different processes involved physiologically in what is in popular parlance called "seeing." Emphasizing again the difference between the psychological and physiological attack on the problem, he resorts to a "chronogenous localization." He states that there is a close relationship between H. Jackson's views and his genetic or genetic-retrograde interpretation of localization and that Wilbrand-Henschen's theory is only of clinical interest (182). Keeping in mind these formulations as well as his views on different kinds of localization and on the effects of diaschisis, one sees Henschen's entirely different point of departure in reading "that every cell, or every cell complex is endowed through education with a special capacity" to store up images (111). Whereas he thinks that the "sensations" of the psychologist are not the simplest *psychic* elements (112), von Monakow admits the *Einheit* of the psychological process and defines elements reached by *physiological* analysis (182). Poppelreuter (213)

arrives "inductively" on the basis of some hundred cases at the "principles of dissolution" as regards the visual system in cerebral lesions. According to him, we have to do, firstly, with a number of part-systems: (1) the brightness system; (2) the color system; (3) the form system; (4) movement; (5) direction. These different part-systems may be more or less independently disturbed. It is to be noted that according to Poppelreuter the form system of the normal person has seven levels and it is of special interest that the "amorphous forms" stand as high as the fifth level. The second system is the ordinary topographical system which establishes relations between site of lesion and visual defect. Thirdly, we have the principle of lessened differentiation, which assumes that there is not a strict loss of the function but a decrease in differentiation. On the basis of these three principles the wealth of pathological observations has to be interpreted. Poppelreuter's pathological material, in which, as he claims, no case of complete hemianoptic blindness was found and where the retention of some rudimentary function could always be ascertained, seems to indicate the following "levels of dissolution": (1) amorphous quantitative light sensitivity; (2) size perception without definite form; (3) amorphous form perception; (4) perception of discrete objects; (5) mild amblyopia; (6) normal vision. The fact that we have levels of *"Abbau"* has been frequently discussed. Here Piéron, Holmes, Riddoch, Hine, and others should be mentioned. The number and kind of levels, the fact whether or not they can be disturbed independently, furthermore, the sequence of dissolution, are necessarily controversial questions. Goldstein (92) suggests that both v. Monakow and Henschen may be right and wrong. There is a projection in the sense that a certain part of the retina corresponds to a certain part of the calcarina; but the fibers from the retinal part in question run not only to this projection center, but also diffuse in a manner which has as yet not been determined anatomically and may be only understood in the light of certain physiological principles. In general Goldstein points out the extremely complex relations between a certain symptom picture and certain lesions. The cortex is not an artificially separated part of the central nervous system and the site of lesion, kind and time of injury, the total psychic and somatic status of the person play a rôle (92). We are likely to be fascinated by histological results when it is possible that electrochemical processes are the basis for function. The facts concerning the question of a restitution of

lost functions suggest (compare **4, 224**): (1) under normal conditions the anatomical structure determines the function, but under pathological conditions it permits of "an entirely different functioning"; (2) the reorganization is determined by the principle that the apparatus assumes its normal function as long as possible even though the effect may be qualitatively inferior; (3) in the reorganization, a part of the apparatus takes over the function of the whole. Goldstein is favorably inclined to v. Monakow's view that only the nonpsychological processes are more or less definitely localized, but he does not want to give up the possibility of localizing. Although it is true that a psychic process finds its correlate in an excitation of the total cortex, this process of excitation is organized in such a way that the different cortical areas have "a certain characteristic importance." Referring to the above mentioned patient Schn.., he recalls the fact that here a circumscribed lesion led to different symptoms. Each of these symptoms seemed to indicate a different lesion. As a matter of fact, these disturbances were not related to different lesions, not even to the diffuse effects of one lesion, but only to one circumscribed lesion. The psychological analysis arrived at the result that the large number of disturbances had to be traced back to an impairment of a "basic function" of the cortex which manifested itself in different functions. On account of its close relation to optical functions, this basic function could be most easily injured through a lesion in the visual area. Thus the value of psychological analysis for questions of cerebral localization in general is evident. In this connection, the fact that phenomenology is coming to the foreground is of special interest. This seems, so far as our problem goes, to imply an insistence (1) on descriptive analysis; (2) on the importance of what has been called "act," "intention," "function," etc., in the psychological sense (*Funktion*). What at present is most needed in perceptive psychology, so Köhler thinks, is an "*unbefangenes Sehen*" of the phenomena (**146**). In perception, we have to realize the importance of "the qualitative and topographical aspects of the stimulus configuration" as contrasted with the blind force of an "anatomical mechanism." Such a mechanism will hardly throw light on "round," "simple," "symmetrical," and similar visual attributes. Undoubtedly, the implications of this statement are still more far-reaching than Poppelreuter's conclusions. "The *Gestalt* problem in perception does not admit of an empiristic interpretation," writes Köhler, in a time which emphasizes the "effect

of learning" and the "influence of past experience." Lashley, on the basis of his learning experiments, states (159): "The thing which is localized is, in the majority of cases, the ability to relate any reactions in certain specific ways, rather than a relation between specific reactions. That is, modes of thinking or reacting rather than specific thoughts or reactions are eliminated by cerebral lesions." Here the emphasis on "*Funktion*" is obvious. Schilder (233) thinks that the "*Akt, die Zuwendung als solche*" cannot be localized, and Neber (189) states that the "*Beziehungsfunktion*" cannot be really destroyed by cerebral lesions in humans. But, again, certain acts and "certain modes of thinking or reacting" may be destroyed. In view of the many difficulties involved here, Feuchtwanger's statement of the problem will be appreciated (59, pp. 83–96). Mollweide (180), starting from the possibility of a close relation between higher optical functions and certain parts of the frontal region and reviewing other relations of this kind, suggests that psychic phenomena are acts "in which and through which a precentral and postcentral physiological component seems to be united in a higher organic unity." He arrives at the theory that all higher psychic functions have a material substratum of motor and sensory centers which has a "bipolar arrangement."

In the last part of this paper we have referred only to the more conspicuous views concerning localization and have not taken into consideration the large number of slight modifications of these views.

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269. WOOD, C. A., Shrapnel Wound of the Occipital Region with Involvement of the Visual Centers. *Ophth. Rec.*, 1915, **24**, 392.

270. WORMS, G., Les troubles visuels subjectifs chez les blessés crânio-cérébraux. *Ann. d'ocul.*, 1923, **160**, 456.

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THE MOST RECENT TEXTBOOKS OF PSYCHOLOGY

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MADISON BENTLEY. *The Field of Psychology.* A Survey of Experience, Individual, Social, and Genetic. N. Y.: Appleton, 1924. Pp. xvi+539.

HARVEY A. CARR. *Psychology.* A Study of Mental Activity. N. Y.: Longmans, Green, 1925. Pp. v+432.

BEATRICE EDGELL. *Mental Life.* An Introduction to Psychology. London: Methuen, 1926. Pp. xvi+275.

ARTHUR I. GATES. *Elementary Psychology.* N. Y.: Macmillan, 1925. Pp. xiv+594.

ROBERT H. GAULT and DELTON T. HOWARD. *Outline of General Psychology.* N. Y.: Longmans, Green, 1925. Pp. v+474.

FLEMING ALLEN CLAY PERRIN and DAVID BALLIN KLEIN. *Psychology.* Its Method and Principles. N. Y.: Holt, 1926. Pp. x+387.

EDWARD STEVENS ROBINSON. *Practical Psychology.* Human Nature in Everyday Life. N. Y.: Macmillan, 1926. Pp. xii+479.

In most of the other natural sciences it has become rather superfluous, both for the author of a textbook and for his reader, to encounter on one of the first pages a definition of his science. Not so, unfortunately, in psychology, on the scope of whose subject matter textbook writers are still very much at odds. Indeed, while they give their readers the impression that at the end of the first quarter of the twentieth century they like to regard their science as a "natural science," most of them follow the example of William James in adopting what seems a most queer definition of the latter term, that is, of "natural science." Instead of adopting the definition of "natural science," which was then and is still and will remain natural to every man of science, as the science whose subject matter is knowable through the testimony of witnesses (note the plural form "witnesses," which assures the "objectivity"), James adopted the definition of "natural science" as the part of science which is

"imperfect and incomplete," a criterion which in no way separates objective (truly scientific) knowledge from any fantastic dream of purely individual self-consciousness or introspection—and never will separate it, for no man of science holds that natural science will ever be as "complete and perfect" as "philosophy" by James was supposed to be capable, if not of being, at least of becoming.

That our textbook writers in psychology, with the rarest exception, have no clearer conception of "natural science" than James had it in 1892 (*Psychology, Briefer Course,* p. 3) is evident when one reads their textbooks. Proceeding alphabetically through our list, we observe that Bentley tries to escape the criticism of being old-fashioned by the simple expedient of leaving the old "psychological" concepts virtually unchanged, but by giving them new names which sufficiently mystify the naïve student. Introspection is purified by becoming inspection. Mental functions lose their ghostlike aspects by becoming functions of the "total organism" which, the total organism, is in turn defined as "the" organism plus something that is "not" organism, that is, the "total" organism is the "mind-body." (Asking his graduate students what that meant to them, the reviewer received a silent head-shake as an answer.) Psychophysics becomes up to date by being called the "limits of psychosomatic function." And so forth, old wine in new pipes. While Bentley is far from turning into the roads of modern objective psychology, he deserves credit for having the courage to place, if not "the conscious," at least "the unconscious," outside of the field of science.

Carr is ultra-conservative. "Psychology is primarily concerned with the study of mental activity. . . . The mind has a potential influence upon the future activity of the organism. . . . Psychophysical processes are acts of which the individual has knowledge." In spite of these three statements, however, Carr tells us (p. 6) that "Consciousness is an abstraction that has no more independent existence than the grin of a Cheshire cat." When the reviewer still had the enthusiasm of youth, he, too, still believed that such statements as the foregoing were "teachable science." Psychology and physiology are distinguished by Carr saying that the former is concerned with "the adjustment of the organism to its environment" and the latter with "the maintenance of the structural integrity of the organism." To the reviewer "adjustment" and "maintenance"

in biology are one and the same and cannot delimit two sciences bordering on each other.

Edgell tells her readers that psychology is a biological study having a less definite body of doctrine than other sciences, only traditionally related to "spirit," especially interested "in the great undertakings of modern life and society." Unfortunately the later chapters are much more traditional than this refreshing introduction makes us hope for.

Gates obviously had his eye on normal school teachers of psychology as the prospective buyers of his book, for he "omits the more highly technical phases of the subject," proposes to "explain the behavior of living organisms in general," thus defeating the competition of the teacher of "biology," and at once, at the end of the first chapter, teaches his students how "to make up the new types of objective tests now profitably used in many places," obviously believing that this is not "a highly technical phase" of the subject for "the general student" for whom he announces he wrote this book. His definition of psychology includes "an extensive account of the introspective studies of conscious states and processes." Where is the logic of all this? But "it sells," and that is the main thing in writing a textbook for our modern mass education.

Gault and Howard are obviously admirers of James, Ribot, Ward, and Wundt, whose portraits ornament this book. They obviously never saw a sleight-of-hand performance, for in "orienting" their students (p. 7) they teach them that "if the act of this moment were contradicted by the act of the next moment, this would indicate loss of mind." But their metaphysical implications probably require this teaching that "the intelligent individual acts as one." They pretend to be able to observe a dog's consciousness, for they teach their students (p. 6), "Conscious behavior lies in wait for the next event. Observe a dog, for instance." Observing this dog must be for the freshman taking this course highly illuminating about consciousness in general, revealing features of his consciousness which he never dreamed of before. General psychology (p. 14) is defined as that science "whose office is central and coördinating" and whose "object is to determine the nature of minds." Nevertheless, they are strangely concerned about the welfare of the physiologist trying to advance his own science, for (p. 16) they warn him that he "must take account of the facts of mental life," and that (p. 17) only in "the science of physiology as at present conducted" is it unfortu-

nately(?) true that "physiological interpretations are physical and chemical." Obviously they expect a new era in physiological science and a continuation of the old metaphysics in psychology.

Perrin and Klein tell their students that psychology in common with all the biological sciences studies "the behavior of an organism," but that psychology is the only science which studies "the organism as a whole." The reviewer is loath to repeat here what he has said elsewhere about this totally inadequate definition of psychology. Perrin and Klein believe they can prove their point by saying that "only intact organisms manifest emotion, learning, skill, talent, intelligence, and personality." They ought to know that a decapitated frog manifests the "skill" of wiping his body, the "emotion" of the sexual embrace. And, conversely, they believe they have proved their point by teaching their students that no emotion, learning, skill, talent, intelligence, or personality "are exhibited by separate organs or systems of the body," obviously hoping not to have any students clever enough to remember that neither bile nor sugar is secreted by "the liver separated from the body," nor urine by the kidneys "separated" from the blood stream, that no hair grows vigorously from a man's chin when "separated" from certain hormones, etc., etc. But the illogical definition of their science is a minor fault in comparison with the courage displayed in doing without the traditional division of the text into chapters on "sensation, perception, intelligence, etc." They rightly say that these divisions only suggest "faculties," instead of freeing the student from such unscientific conceptions. Psychology would be fortunate indeed if all textbook writers would take an equally determined stand against the "faculties," instead of denouncing them, as most authors do, on one of the introductory pages and quickly admitting them again in the dignified position of chapter heads.

Robinson in his "practical" psychology tells us that psychology deals with human behavior "and" mental life. In this way he catches the public both going and coming. One can hardly blame the author of a "practical" psychology for being a "practical" man himself. The principles presented, he says in the preface, have been "selected" with respect to their "relations to the personal and social life of the student." The reader naturally expects the book to be crammed full with technical hints for the improvement of one's personal and social life. But the author disappoints him by saying that "such a practical psychology is one in which scientific principles

are given more emphasis than technical devices." One is reminded of Talleyrand's famous remark that language has been invented for the purpose of hiding one's thoughts. In addition to his all-inclusive definition of psychology mentioned above in this paragraph, Robinson informs us that this "science" includes a great deal which "everybody knows already" before entering upon its study; his "science" merely contains "more facts and facts of greater accuracy than are to be found in popular opinions." The reviewer cannot help contrasting this with his own method of teaching. When he steps before his beginners' class for the first time, he promises his students to make the strongest possible effort to teach them only such facts and explanatory hypotheses as are yet totally unknown to them. He does not share Robinson's belief that "opinions previously picked up" belong into the teaching of any—psychological or other—"science." That kind of belief only encourages legislators who never went to high school or college in their endeavors to legislate for science under the inane impression that they "know some." Why is it that a chemist does not tell his beginners that they know already a great deal of chemistry because chemicals are always with them? ("Human nature is always with them," Robinson, page 4, line 3).

At the end of the first quarter of the twentieth century most psychologists admit that their science is more or less concerned with the functioning of the nervous system. Obviously the psychology student ought to learn (1) that the main function of nervous tissue is conduction, (2) that since a nerve element through differentiation has become a more highly conductive cell than an undifferentiated cell, it surely may undergo further changes in conductivity during the individual's life, (3) that the synapses are likely to offer contact resistance varying from time to time, and (4) that the neurons must be arranged in accordance with a certain design, a certain architectural plan, in order to serve their purpose in biology. Let us see what our authors teach about the nervous system.

Bentley presents the following beautifully printed pictures: A schematic view of the retina and one of the organ of Corti, a taste bud, various other "nervous terminations," a picture of "the central nervous system," a schematic view of paths between the skin, the cerebrum, and a muscle, various types of nerve cells, a basal view, a side view and two inner views of the human brain, a section of the cortex, two maps of "functional areas" of the brain. About six

of the more than 500 text pages of the book refer to these beautiful pictures. It is clear that the author endeavored to give just as little about the nervous system as he thought he could escape with and to give that by means of the dignified method of beautifying his book with pictures irreproachable from the point of view of the artist in black and white.

Carr devotes 25 of his more than 400 pages to a discussion of the nervous system. About six of these pages are virtually occupied by views of the morphology, the gross anatomy, of the nervous system. Several other pictures make fairly clear the superposition of centers. But the only diagram which is intended to explain seriously a nervous function (habit formation) is an unfortunate design (on page 37) which explains only on the basis of "simultaneity" of two stimuli and probably is found in Carr's text merely because it seems to have an infectious quality carrying it through the textbooks as the influenza is carried through the nations. Habit usually (in school, for example) is formed, not by simultaneous, but by successive stimulation, a fact totally disregarded by the author. Another serious fault of the diagram is that it is not reversible with respect to the two "reflexes," y forcing x, but x being incapable of forcing y—as if our "mental activity" were as seriously limited as is thereby implied. Habit is referred exclusively to changes "in the synapses," as if conductivity changes in the whole neuron were not equally, even more, possible than mere changes in contact resistance. From this inadequate discussion of habit formation the author jumps to a discussion, for three pages, of "the neural bases of intelligence" and "the localization of mental functions," as if he were trying to get rid of a disagreeable task most expeditiously.

Edgell (in a total of 275 pages) devotes 23 pages to "the build and functions of the nervous system." But of these pages 18 contain little more than picturesque enough descriptions of gross anatomy, two give details of finer anatomy, and only three pages "illustrate" the functioning of the system by such, much too vague, statements as this: "We should have needed to note that the coördination of visual and kinesthetic stimulation would involve excitation of association fibers in the cortex." How habit formation, which ought to be the center of interest to the psychologist, can be understood as a function of the nervous tissue is not made clear.

Gates gives one the impression of devoting more space to the nervous system than the authors just mentioned. The pages from

32 to 106 and from 281 to 306 seem to serve this purpose. This looks like about 100 pages among 590. But on scrutinizing these pages one discovers that a good many of them are occupied by numerous popularizing descriptions of the various sensory surfaces without giving the student fundamental principles of corresponding weight. Glandular function takes up five of these pages, well written, but not very logically fitting in the context, inasmuch as they are (p. 88) "activity leading to further activity" in a physiological, non-psychological, sense, scarcely involving any psychological principles or laws. About 18 pages are wasted (in the reviewer's opinion) on a discussion of the relations between consciousness and the gross anatomy of the nervous system. With respect to function, much use is made of a "law of use," which obviously does not exist, since it would turn a growing human being from month to month and year to year into a more and more stereotyped reflex machine, a consequence which the author carefully hides. Habit formation is explained by a diagram (p. 287) which has not the defect of being unsymmetrical (like that used by Carr), but which is based on a perfectly mystical assertion, made on the same page, that when another sense organ functions simultaneously "the barriers are broken down." The reviewer wonders what a teacher using this text would say if a clever and logically thinking student should ask "But what cause, in accordance with what natural law, does break down such a barrier?" Fortunately for the psychology teacher, he is unlikely to have such a student. We are hardly surprised to find that the author introduces, "in a simple yet faithful way," as he says on page 300, not a cause recognizable by natural science, but a ghost, the subjective state of "satisfyingness" as that cause which "breaks the barrier." That in the learning of most of our variations of reaction (in school especially) it is not true that (p. 306) "two stimuli are repeatedly given simultaneously" since no schoolmaster can ask and reply at the same time, is (intentionally?) overlooked. This is probably in agreement with the announcement made in the preface that "technical terms and concise definitions have been used sparingly." They would have become unavoidable if he had told the truth. "The student needs illustrative detail," says the preface. True! But illustrating what? Concise scientific principles, carefully defined, one should think. "My treatment of the mechanisms is schematic," says the author. To the reviewer it appears totally unschematic, highly "journalistic," emphasizing "the high points" as the journal-

ists say, and for that very reason of course extremely readable, that is, entertaining for the reader who stays on the surface of things. Very likely the college or normal school student is that kind of a reader and for him the book was written. It sells, undoubtedly.

Gault and Howard, if we include the 20 pages on habit formation, devote to the nervous system 44 of the more than 450 pages of the book. "Habit," they say on page 63, "stands in relation to consciousness and *hence* holds a peculiar interest for the psychologist." The poor psychologist who believes that psychology can get along without talking of consciousness, stands dejected when he reads this, for the right to be interested in "habits," his center of interest, has been denied to him. Habits, according to the authors, have four characteristics. (1) They are "stereotyped." This obviously means that the student is to be taught that a habit is not slowly acquired, but springs into existence fully armored, like Athene from the head of Zeus. (2) "Habit is facile, goes straight to the mark." This again assumes that a habit comes into existence fully armored. As long as it does not yet go straight to the mark,—"What is it then?" asks the reviewer. (3) In habit "we do not notice what we are doing." To the reviewer this is straight metaphysics. (4) "Habit implies propensity to do:" To the reviewer this is redundance of talk, but not a scientific principle. Habits are formed, according to the authors, in this way. Synapses which are "at birth neutral and unformed," are later "opened up under pressure." What kind of pressure?(!) Finally, the current is "switched" over pathways "which have become (are thereby?) established as lines of low resistance." The selective activity of switching thus manifested "is conscious effort." "We have no means of knowing how . . . Physiology fails us here." The reviewer dislikes to use disrespectful terms. But if he is to speak frankly, he can only say that to a person trained in the methods of physical science, the above statements (quoted) of the authors appear childish. And if "physiology failed them," that was not so much the fault of physiology, as their own in lacking information in the terms of physics, chemistry and biology. The nervous system is not "a network of relay stations," as they say on page 41. Did the authors ever see a "relay"? Think of a network! On page 44 they say "the impulse is instantaneously switched from the afferent to the efferent fiber," but forget entirely to mention who the switchman is. Figures of speech are sometimes of some value, but they must not be mixed, but used consistently.

On page 56 they say "it is a profitable exercise to trace the pathways followed by nervous impulses," but fail completely to point out what the profit consists in. Of course, it gives them a chance to talk "learnedly" of the thalamus, the occipital lobe, the ventral horn, the pre-Rolandic and post-Rolandic areas, etc. But: what principle or law is conveyed to the student? Does the profit consist in the dogmatic statement added to mentioning "the post-Rolandic area" that "once it has arrived there, we are conscious of having touched the object"? Is that science or metaphysics?

Perrin and Klein devote their second chapter, 54 among 380 pages, to a description of "the biological foundations of behavior," and of these 54 about 25 pages describe the nervous system. They inform their students that afferent paths lead "the impulse" to nerve "centers" and that efferent paths carry "the impulse" out of "centers." But when the student asks for a definition of a "center," he is given (on pages 39, 55) the mystifying answer that it is a sort of "redirecting" agent, and on page 44 a center is defined as a contact point of more than two neurons, or rather "a group" of such points (in what sense a group of points?) of contacts,—to quote: "a group of synapses having a common function." What the "common" function of the group consists in, is not clear. It is said, however, that a synapse is "selective," leaving it to the imagination of the puzzled student to furnish himself with an idea of how a point (synapse) can be selective unless he grasps the suggestion given farther down the page, that "the synapses constitute the switchboards." To a bright student this suggestion is of course inacceptable, for a switch does not work unless somebody or something "moves the switch," which is a movable "bridge." But no switchboard operator is mentioned because none can be mentioned. When will the time arrive when psychologists cease to use such meaningless figures of speech, calling the nervous system a "switchboard" and a "redirecting" agent? When will psychologists become satisfied with calling the nervous system what it really is, a network of conductors and nothing else? On page 46 the authors give "a schematic diagram representing some of the synaptic connections in the spinal cord." It is a very beautiful picture showing the location of half a dozen neurons. The only fault with it is that it is not at all "schematic," that it represents no scheme, no principle of any consequence except that there is some sort of a "distribution,"—by imaginary "switches." We perhaps do our authors injustice if we say they devote only 54 pages to the nervous system. In strict comparison with the other

texts here under review, we should say that the 68 pages of the third chapter also are concerned with the nervous system. The third chapter is mainly concerned with the question (p. 82), "What is the mechanism of substitute stimulus"? As a matter of fact, however, they teach little about what this mechanism might be. They are mainly concerned with enumerating the many conflicting "behavioristic theories" of habit formation. These theories, instead of treating of the mechanism, lay down merely such causative principles as frequency, recency, satisfyingness, emotional accompaniment, etc. What should one say of a meteorologist explaining the weather by saying that it depends on the frequency of clouds, or on the recency of clouds, or on the fact that without clouds the farmer would die of starvation, or that some farmers sometimes get mad at the clouds? We expect the meteorologist to study the physical conditions of the atmosphere and to explain the weather thereby. When will the time come when psychologists regard behavioristic accounts of frequency, etc., as trivial facts which clever students know before enrolling in the course, and leave them out or at least relegate them to a secondary place where the less clever ones may pick them up, but discuss seriously the physico-chemical conditions of the nervous system and thus "explain" habit formation? Our authors take up the whole question of the function of the nervous system again in the fifth chapter, which is entitled "Learning Behavior." This chapter of 91 pages is, however, still more purely behavioristic and less informative about "mechanisms" than the second and the third. Nevertheless they deserve great credit for clearly summing up the multiplicity of behavioristic theories of learning by pointing out (page 242) that every learning process consists only of the fulfilment of three ("mechanical," the reviewer would say; that is, physico-chemical) conditions, (1) keeping at the task, (2) fixation of responses, (3) elimination of responses. We might wish that they had applied this simple insight on first speaking of nervous mechanisms ("redirecting," etc.) in chapter 2 and, continuing, in chapter 3! What a splendid book—even more splendid than it is now—they would have written instead of merely arousing interest in discussion of "mechanisms" and then adulterating it by talking of mysterious "switches" without operators.

Robinson, in his "practical" psychology, which in the preface has promised us to "emphasize scientific principles," devotes 25 of 475 pages to the nervous system. The treatment seems to be a copy of Carr's. On page 35 reappears Carr's "change of pathway" picture

(that intellectual bacillus which can be traced back to the early days of William McDougall). The reader may look back to the reviewer's criticism under "Carr." Robinson remarks (page 36) that "we" possess "only general" knowledge of nervous functions. The reviewer could not make out from the context what the author meant by "we" and by "general." If the author meant that he, Robinson, did not understand the matter very well, why did he not state that fact in such plain words? Probably the reviewer should add to these 25 pages at least the 25 of the next chapter, "Reflexes and Habits," as also treating of the nervous system. On page 48 he states (as a "scientific principle," apparently) that "less definite reflexes are the materials out of which habits are made." This is obvious enough, for what situation is likely to call for a modification of the "definite" sneezing or winking reaction? But since he states at the end of the very same paragraph that more definite reflexes "can" be modified, too, into various habits, what is "the scientific principle" worth teaching and on this occasion to be taught? It must be that the author and the reviewer have totally different conceptions of what "a scientific principle" is, in spite of the fact that the author announces the emphasis on "scientific principles" as the distinguishing feature of his "practical" psychology. Is not the only fact to be learned here this: that there is very little demand for those "technical devices" (educational devices, for example, abhorred by the author?) which might serve to modify "the more fixed" reflexes? What is the logic of all this? Even the following 60 pages on "habit formation" might be said to treat of the nervous system. But the only insight which the student is given into the mechanism of the "conditioned" responses is the reiteration (p. 72ff) that "experience" does it all in some mysterious way. Nowhere is made clear what "scientific principle" is referred to by this term "experience." In the final summary of "learning" on page 128 it is said that to secure the best results it is often necessary to "shift the direction of attention." If the student, eager to learn "scientific principles," asks "what kind" of a telescope or grappling hook this "attention" is, the index refers him to pages 177ff, where he is told again and again (under the assumption, perhaps, that the addition of many zeroes makes something) that attention is nothing but something which "you pay." Is this practical science or mere metaphysics?

We might ask now what the main educative intention of the author of each of these textbooks is and how he tried to realize it. Surely this ought to be revealed by the headings of whatever constitutes

the majority of the chapters. Bentley classes his twenty chapters together in four groups, of which the first is entitled "The Composition of Experience." The second group has the title, "The Organization of Experience," and here we find the fifth, sixth and seventh chapters with the headings "association, attentional clearness, habituation." The third group is entitled "The Psychosomatic Functions." It is by far the largest and contains ten chapters with the headings "nature of psychosomatic, perception, memory, imagination, action, emotion, understanding, thinking, antecedents, limits." The titles reveal what the reading of the chapters reveals, that Bentley follows tradition in talking about things to which we have been accustomed for so many years in the "introspective" psychology, but that he talks about these things in a decidedly more beautiful, more "esthetic" style, than we have been accustomed to from the authors of the past, and that he is a master of inventing for the old terms, whenever possible, new ones which look better and make us for a little while even forget that he is merely talking about the old, old things in new and less familiar words. Brill, who in a review called Bentley's book "arid psychology," did not do the author justice in calling it so. It all depends on whether the reader is interested in that stuff. If he is, Bentley's book is far from being dry reading. But for that reason Brill's books are dry reading to the present reviewer: they seem to be addressed to children looking for jokes. The fourth group of Bentley's chapters is entitled "The Socialization and Development of the Psychological Organism." It contains only three chapters with the headings "nature and forms of socialization, individual development, racial development of the psychosomatic organism." It is an abbreviated social and comparative (animal) psychology, full of metaphysic-poetic speculations and, like the whole book, written in a most beautiful style. The author is quite correct when he says of his own book: "The exposition labors over mountainous ridges, hurries across well tracked and fertile plateaus, toils in morasses, drones through arid deserts, and pauses for refreshment in the occasional oasis." Let him who "takes a psychology course" for the sake of literary refreshment use this book as his text.

Carr's educative purpose is to furnish the student with "a clear and concise statement of general principles," which are quite obviously the same principles to which we have been accustomed for half a century, as will be seen from the headings of the middle eleven of the seventeen chapters making up the book: "Perception, space

perception, ideas, reasoning, practice, retention, vegetative activities, affection, volition, the self, mental development." The other six chapters are more modern, but do not constitute the bulk of the treatment. The first is an introduction. The second and third are mainly concerned with the nervous system and the fourth and fifth are a kind of behaviorism. At the other end, the seventeenth chapter is entitled "The Measurement of Ability" and is a brief account (32 pages) of "testing methods and the doctrine underlying the most popular tests." In thus making up his textbook, Carr states, he has been stimulated by the *sympathetic* attitude of a considerable body of students. This criterion of wholesomeness of the subject matter, in the reviewer's opinion, may testify to the author's teaching ability, but does not necessarily testify to the progress of the science due to the publication of the text.

Edgell wants to sketch the springs of human behavior for the benefit of students of the social sciences. She has succeeded in this purpose as well as, if not better than, most textbook writers who claim this as their purpose. Even if there are such chapters as sensation, ideation, the unconscious, thought, sentiments, they are not treated as science for its own sake, "in order to be able to give an account of mental life," as old-fashioned psychologists would say, but rather, it seems, because the author feared that critics would deny her book the title of "an introduction to psychology" in the absence of such chapters. While the book is no contribution to science, it probably fulfils its educative purpose of furnishing "a basis for the intelligent study of society" for students not very well trained in the natural sciences. It is written popularly without being commonplace or sensational or vulgar as many "popular" texts are. There are numerous "literary" illustrations in the book.

Gates very cleverly mixes the old-fashioned chapter headings, "sensations, feelings, emotions, perceptions, reasoning, imagination, intelligence," in with modern looking headings so that he who objects to them as "faculties" does not too readily discover them, whereas he who wants them will find them and be satisfied. Among the more modern looking chapters are two on "urges," the eighth and ninth. The main thing the student learns in the eighth chapter seems to be that he may call them, to suit his taste, impulses, cravings, tendencies, drives, and what not, as well as urges, and that opinions as to their number differ from "one" to "infinite." The chapter seems to have been written, not by a man of science, but by a dictionary

editor, in spite of the fact that the author in the preface states expressly his conviction that "a text should not be a dictionary of terms." There is an "urge to secure warmth when cold," an "impulse to sneeze," a "sex craving," an "urge to care for the young," and many another "urge." Just what scientific principle the student learns from all these very obviously existing "urges" is not clear to the reviewer. "Knowledge of the existence of these important impulses is of great significance," says Gates at the end of the chapter on page 245. The reviewer doubts if there ever was a college freshman or high school student who, until he "took this course," doubted the existence of these "urges." The author then urges the student (p. 245) to "take the tendency to hoard. When does it die out?" The reviewer wonders how the student or anybody else, including the reviewer, can know that. "Why do so few people accumulate wealth?" is another question. Is this a question for the psychologist to answer? The reviewer would leave such questions to his colleague in economics to ask and answer. "What impulses should be added to the list?" is the last question on page 247. The reviewer would say: At least 999. The following chapter begins with the question "how dominant urges may be thwarted," answers it by saying that they may thwart each other, that they may be thwarted by "floods, drought, business depression" (Is that psychological science?), that ambition to be a social lion (p. 251) "may be thwarted by a disfigured face" (Is that psychological science?), that "some misfortunes are the more annoying because they foretell other thwartings," and ends with the quotation that "the hell hereafter is no worse than the hell we make for ourselves." The scared student now has a strong enough "urge" to take up willingly the study of the following ten chapters, which are mainly concerned with problems of educational psychology, such as the laws of learning, the measurement of human traits, etc., which are masterfully presented by the author who is here in his very element. Sprinkled in, however, are also chapters on perception, imagination, etc. In the chapter on perception Gates mentions Weber's Law and is so carried away by enthusiasm for his teacher's achievements that he says of the latter, "It remained for Thorndike to discover the practical use" of Weber's Law. He obviously was not aware in writing this that a hundred years ago the astronomers made "practical use" of Weber's Law, that a psychologist of the name of Fechner "applied it" to esthetic investigations, etc., etc. Perhaps

the reviewer should not in a general review pick out special flaws. Nevertheless, he cannot abstain from criticizing the author for uncritically copying the false statement (p. 491 f) on the influence of tobacco that this drug "slows down" and has a "detrimental influence" on intellectual work. The author does not sufficiently know the literature on the effects of drugs. The reviewer wonders if in writing this book of nearly 600 pages on short notice the author employed clerks familiar with the use of scissors and paste rather than a critical survey made by himself of the stuff he was writing about. His objection to "concise definitions" looks like a hint at the probable reply.

The educative ideal of Gault and Howard in writing their text is an unusual one. They regard themselves as the chief "recruiting" officers gathering the human material from which "the professional psychologists of a quarter century hence" must be picked. They have "no prickings of conscience because they have deliberately gone about this." They are "less interested" in teaching their students "the science of psychology" than they are in "kindling their enthusiasm while the courage of youth is in their veins." To the reviewer it does not seem so certain that the "enthusiasm" for professionally representing a science, if it is to be the desirable kind of enthusiasm, can be kindled in any other way than by making the student thoroughly familiar with the most progressive methods of thinking about the subject matter of that particular science. The authors also assert that ultimately "every student is bound to become" some kind of an "ist," but that they are going to "present the material unbiased." To this the reviewer would reply that he himself neither is any kind of an "ist" nor wants to be one unless it is a question of being a "scientist," and that, as a teacher, in presenting the material to his students, he has *a very strong bias* against presenting anything which is inacceptable to *a man of science*, and that thus he hopes to prevent his students from becoming any kind of "ists." How can ideals differ so extremely? From what the authors announce in the preface one might think that they use "revivalist" methods of teaching. As a matter of fact, the nine (among a total of fifteen) chapters, from the fifth to the thirteenth, are quite sanely and well written and no more traditional than is to be expected of chapters going under the headings of "sensation, attention, perception, memory, imagination, conceptual thought, feeling and emotion, instinct, voluntary conduct." The last two (four-

teenth and fifteenth) chapters are in the reviewer's opinion the best of the book, and, making allowance for the fact that they are brief (42 and 38 pages), are exceedingly well written and instructive to the reader. They are entitled "Applied Psychology" and "History of Psychology."

Perrin and Klein, after devoting three chapters to a kind of biological or neurological psychology, add a fourth chapter under the title "The Motivation of Behavior." They do "not attempt," as they say, "to distinguish between 'introspection' and 'verbal report." They divide the chapter into three subdivisions on physiological drives, emotions, social motives. The student is strongly impressed with the notion, which the authors probably—and rightly—intended to convey, that the emotions, too, are a kind of "physiological drive." But then he suddenly is confronted with "social motives," but is *not* told that these are also a kind of physiological drives, because the authors do *not* want to distinguish "verbal reports." To the student these "social motives" under the circumstances can hardly be anything but a kind of "spiritual factors," non-physiological drives, first discovered by Cooley (p. 185) within "the social consciousness." This presentation of the social motives, together with the other two and yet distinct motives, seems to the reviewer methodologically wrong. The authors' *justification* of regarding these three "drives" logically as coödinate, by saying with Woodworth that the "drive" explains the "why" and the "mechanism" explains the "how," does not appeal to the reviewer, who is too familiar with the methodology of the natural sciences which explain the "why" by and through the "how" and not by "drives." Every other method leads to metaphysical speculation. The fifth chapter is on "Learning Behavior." It is an excellent account of "behavioristic learning experiments" and non-neurological "theories" based on such experiments, which the authors sum up in the words, "They mark the approach of more comprehensive answers to these problems." The sixth and last chapter "Intelligent Behavior," is devoted to a more detailed account of that part of learning behavior as discussed in the preceding chapter, which consists in or is based on (p. 293) "language acquisition." Intelligent or "mental activities are substitute or symbolic responses." The only thing the reviewer regrets is the fact that the authors have not clearly indicated this to the student as their attitude toward the term "mental" from the very beginning of the book and have not let

themselves be guided by this definition of "mental" consistently throughout the book.

Robinson, in his "practical" psychology, asks on page 56 the very practical question, "Why do people in all parts of the world mate, construct houses, etc.?", and adds contemptuously, "There is a type of person who says that these things are done because it is human nature to do them. Of course, it is perfectly clear that this is no answer at all." He goes on for three pages proving that this universality is neither due to "inherited connections within the nervous system" nor to "social inheritance," and concludes this argumentation on page 59, to the reader's surprise, with the following: "The main reason why there are universally present elements in human behavior is that there are universally present reflexes, etc." Why, then, three pages before, such a contempt for "that type of person"? The reviewer does not see the logic of it. It seems to the reviewer that Robinson's educative aim is "practical" in the same sense in which a church sermon is "practical" in contrast with a course in algebra. But what becomes of the "scientific principles" for whose presentation this book was written, when they are so illogically presented? The reviewer would be sorry if he were one of the six gentlemen mentioned in the preface who read and approved the manuscript before it was printed, and he uses this opportunity for raising the general question: "Is it legitimate (advertising or what?) practice for any author to state in the preface an array of glorious names who are to be held responsible, more or less, for the contents of what they do not claim to have written?" Robinson divides his book into fifteen chapters which are distributed over six "parts." The first part is entitled "Preparation for Psychology" (the reviewer questions the legitimacy of calling a part of a text the "preparation" for the science which is treated in the text!) and the second part "Habits and Their Acquisition." These two parts have been referred to in our general criticism concerning the treatment of "the nervous system" by textbook writers. Robinson's third part is entitled "Perception." The fourth part, "Ideation," contains four chapters on ideas and concepts, memory, imagination, reasoning. The fifth part is "Feeling" and contains one chapter on feeling. The 245 pages of these three "parts" are just as traditional as their chapter headings indicate. The author, in writing them, seems to have been guided by what he states on page 310 as his own conviction: "A struggle for originality which is carried on always and everywhere,

whether or not there is a need for it, is an unfortunate affair. It is such a waste of energy!" But "what, then," would the reviewer ask, "was the need for publishing this book?" Unfortunately, it seems to be hard for a university professor to obtain promotion unless he publishes a book "whether or not there is a need for it." In the chapter on feeling (p. 386), Robinson says quite rightly that "fright is manifested by babies too young to have seen fright in older persons," and adds: "J. B. Watson's investigations have added greatly to our knowledge about this matter." The reviewer begs to differ and to assert that these investigations have taught us very little that mankind was not perfectly aware of for thousands of years. Part VI, on "The Individual," contains a chapter on personality and a chapter on abilities and their measurements. This last chapter is made up exclusively of "technical devices" which, as the author says in the preface, must not(!) be emphasized in such a book. He speaks of rank order, of calibration, of graphs to show readily the results of measurement, of a tapping board and a perforated ("steadiness") board, of the technical devices of the "army examinations," of profile charts, of technical devices for testing the value of measurements.

Summing up now his general impression of these seven recent textbooks, the reviewer would say the following: There is still very little agreement as to what constitutes "the science of psychology" unless we restrict ourselves to the introductory pages, which, unfortunately, nearly always promise a more scientific treatment than the following (traditional, metaphysical, literary-poetic or sermonizing) chapters actually present. Nevertheless, it is a sign of progress that at least in the introductory pages some kind of "scientific" ideal is upheld. There is, however, even in these most recent books, *no clear recognition of* (what the reviewer regards as a fact) that a "science" of human life does not deal with anything immaterial, cannot be anything but (to use the words of A. P. Weiss) *the science which describes the biosocial transformation of the animal-like infant into the civilized adult as we know him.* There is only the faintest recognition of the fact that it is the psychologist's *scientific duty* to enlarge our *neurological* knowledge by suitable *hypotheses* and then to explain with the most rigorous logic of the mathematician the rôle played by the nervous system in this transformation of the infant into the adult, instead of engaging in childish talk about "relay stations" where *guardian angels play the rôle of traffic policemen* or

about "switches" *without a switchman.* It is, perhaps, the most significant sign of progress that writers of psychology textbooks actually begin to show the courage, not only to denounce the "faculties" in their forewords, but to cast them out to the extent of refraining from using them as chapter headings. As soon as we have reached this point, the road for the creation of new, and scientifically valuable, psychological concepts is open.

MAX F. MEYER

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BOOKS RECEIVED

American Health Congress, 1926. *Joint Sessions Relation of Venereal Diseases to Vision Impairment and Venereal Disease Control.* N. Y.: 1926. Pp. 73.

OLIVER LODGE, ARTHUR CONAN DOYLE, FREDERICK BLIGH BOND, L. R. G. CRANDON, MARY AUSTIN, MARGARET DELAND, WILLIAM MCDOUGALL, HANS DRIESCH, WALTER FRANKLIN PRINCE, F. C. S. SCHILLER, JOHN E. COOVER, GARDNER MURPHY, JOSEPH JASTROW and HARRY HOUDINI, *The Case For and Against Psychical Belief.* Worcester: 1927. Clark Univ. Pp. vii+365.

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DANIEL ESSERTIER, *Les Formes Inferieures de L'Explication.* Paris: 1927. Alcan. Pp. iii+356.

A. J. SNOW, *Psychology in Personal Selling.* Chicago: 1926. Shaw. Pp. xvi+620.

WALTER V. D. BINGHAM and MAX FREYD, *Procedures in Employment Psychology.* A Manual for Developing Scientific Methods of Vocational Selection. Chicago: 1926. Shaw. Pp. xi+269.

OLIN TEMPLIN and ANNA MCCRACKEN, *A Guide to Thinking.* A Beginner's Book in Logic. N. Y.: 1927. Doubleday, Page. Pp. xiv+252.

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BETH WELLMAN, The Development of Motor Co-ordination in Young Children. *Univ. of Iowa Stud.,* 1926, 3, No. 4, pp. 93.

MADORAH E. SMITH, An Investigation of the Development of the Sentence and the Extent of Vocabulary in Young Children. *Univ. of Iowa Stud.,* 1926, 3, No. 5, pp. 92.

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LEO BRONSTEIN, *Lutte et Reconciliation.* Essai sur la manifestation du reel dans l'art. Paris: 1926. Alcan. Pp. 371.

JOHN H. PARSONS, *An Introduction to the Theory of Perception.* Cambridge: 1927. Univ. Press. Pp. viii+254.

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MAX SEHAM and GRETE SEHAM, *The Tired Child.* Philadelphia: 1926. Lippincott. Pp. xvi+342.

C. J. WARDEN, *A Short Outline of Comparative Psychology.* N. Y.: 1927. Norton. Pp. 96.

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MRS. VANCE THOMPSON, *Normal and Supernormal Telepathy.* Los Angeles: 1927. McCulloch. Pp. 34.

WILLIAM T. ROOT, JR., *A Psychological and Educational Survey of 1916 Prisoners in the Western Penitentiary* of Pennsylvania. Western Pen.: Board of Trustees. Pp. 217.

NOTES AND NEWS

DR. GING HSI WANG, instructor at the Johns Hopkins University, has accepted a position as director of the institute of psychology at Sun Yet-sen University, Canton, China.

AT Smith College, psychology has been accepted as a science on the college curriculum and the introductory course, which is to include, laboratory hours, has been accepted under the rule requiring each student to take a course in experimental science.

DR. LEONARD CARMICHAEL, assistant professor of psychology at Princeton University, has been appointed associate professor of psychology and director of the psychological laboratory at Brown University.

PROFESSOR EDWARD S. ROBINSON of the University of Chicago has been appointed professor of psychology at Yale University.

PROFESSOR KURT KOFFKA of the University of Geissen, and this year visiting professor of psychology at the University of Wisconsin, has been appointed to the William Allen Neilson chair of research at Smith College for a term of five years. At Smith College, Professor Koffka will have a fully equipped laboratory for research.

DR. CARL STUMPF, emeritus professor of philosophy at the University of Berlin, was elected a foreign associate of the National Academy of Sciences at the recent meeting held in Washington, D. C.

DR. ALBERT T. POFFENBERGER has been promoted to professor of psychology at Columbia University.

PROFESSOR KARL BUEHLER of the University of Vienna and Professor J. E. Coover of Stanford University will conduct courses in psychology in the Johns Hopkins University during the first semester of 1927–1928. Professor Buehler will give courses in Child Psychology and the Psychology of Language; Professor Coover, in Statistical Methods and Learning.

PROFESSOR HENRY RUTGERS MARSHALL died on May 2d at the age of seventy-five years.

A MEETING of a section of psychology was held in conjunction with the Iowa Academy of Sciences at Iowa City on May 6–7 under the chairmanship of Professor Christian A. Ruckmick of the State University of Iowa. Professor J. E. Evans of Iowa State College was elected chairman for the coming year.

THE fourth International Congress for Techno-Psychology will be held from October 10 to 14, 1927, in the apartments of the International Institute for Intellectual Coöperation at Paris.

DR. M. O. WILSON at the University of Oklahoma has been promoted to the rank of associate professor of psychology.

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